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PRESIDENT LOUIS C. ZOPF: A BIOGRAPHICAL SKETCH*

MELVIN R. GIBSON

Louis Christian Zopf was born August 28, 1904, in Marengo, Iowa, to Charles Frederick and Clara Frieda Dorothea (Buelow) Zopf. Research has failed to uncover exactly what pharmacy recruitment aid was being used in Marengo, Iowa, at the beginning of the century, but young Louis decided pharmacy was the profession for him at the age of eleven! On October 10, 1915, he marched into the A. J. Gibson Pharmacy in Marengo and launched himself on a career.

Wherever there's an industrious, conscientious, inexperienced lad one usually finds at least one wiseacre ready to take advantage of him. In this instance it was J. F. Rabe, then a young registered practicing pharmacist, now Secretary of the Iowa Pharmacy Examiners. Rabe proceeded to lead young Louis down the path of practical jokery. Louis was baffled in his attempt to find pigeon milk, confused by the undersupply of left-handed monkey wrenches, and he even lost a coat of tongue trying to taste the "sweetness" of frosted CO_2 connections in preparing carbonated water for the fountain. But despite all this, young Louis was determined that pharmacy was what he wanted, and not even J. F. Rabe was going to make him change his mind. Possibly at this tender age he learned by negative example that a helping hand and challenging encouragement are more effective methods of teaching than exhibitionism. At least those who have come to know Louis Zopf have come to trust him implicitly, and his students are challenged to approach the standards of conduct he personifies.

Louis had interests other than pharmacy during the days in Marengo High. He was an excellent student and a musician. He played the clarinet. But clarinet playing, studying, and working at the local pharmacy still left time for seeing the attractive daughter of Mr. and Mrs. Kirkpatrick, Aileen. It was a teenage romance. And even though Aileen Kirkpatrick went off to Coe College and Louis went to the State University, the romance flourished, and in 1926 when Louis Zopf became Louis Zopf, Ph.G., he married Aileen Kirkpatrick. Louis Zopf has a reputation for making good decisions: this was one of his best. The attractive charm of Aileen Zopf is an ornament to Louis Zopf and to pharmacy.

With a new wife, pharmacist Zopf set out to learn about retail pharmacy. For a year and a half he worked in the Lent Pharmacy in Vinton, Iowa. In the summer of 1928 he was called back to the University of Iowa to accept an instructorship and to become manager of a newly formed Drug Service Department. The purpose of this department was to store, manufacture, and supply drugs and medicines to

* The author is indebted to the following persons for supplying information for this article: Mr. R. A. Kuever, Dean Emeritus, College of Pharmacy, State University of Iowa; Dr. Joseph B. Burt, Dean, College of Pharmacy, University of Nebraska; Dr. James R. Thayer, Dean, St. Louis College of Pharmacy and Allied Sciences; and Mr. J. F. Rabe, Secretary, Iowa Pharmacy Examiners.

other departments and colleges of the University. As Dean Emeritus Kuever comments, ". . . the growth and development of this department since its inception is due largely to Louis Zopf's wise planning and capable leadership."

Dean Kuever goes on to describe just how effective a job Louis Zopf has done in developing Iowa's Drug Service Department:

> The College of Pharmacy at the State University of Iowa was first of its kind in the land to establish and completely control and operate a hospital pharmacy and a pharmaceutical manufacturing laboratory the products of which are actually employed in treating hospital and out-clinic patients. Both have been in operation for more than a half century and are being used as valuable teaching units in the College of Pharmacy and both are serving to supply many drugs and medicines and now also other useful products to the University on an economic basis that frequently saves as much as fifty per cent of the normal cost. Hence senior students, working in sections, have the opportunity to prepare around 247,000 prescriptions at the University Hospital Pharmacy annually, while junior students prepare annually approximately 100 tons of medicinal and other products which are distributed to ninety departments of the University. The total annual volume of business of the Drug Service Department, under the able management of the Dean, is now in excess of a third of a million dollars.

In 1935 Instructor Zopf became Assistant Professor Zopf, and in 1936 he earned the Bachelor of Science degree. In 1939 the University of Iowa awarded him the Master of Science degree. In 1941 he was made Professor of Pharmacy in charge of Drug Service. In 1952 Professor Zopf was elevated to the position of Dean of the College of Pharmacy of the State University of Iowa.

The reasons for some people being made deans are sometimes obscure. The reasons for Louis Zopf being made a dean were obvious: he was a leader in pharmacy and pharmaceutical education. After entering collegiate work, he lost little time in demonstrating his capabilities. In 1936 he was chairman of the A.Ph.A. Hospital Pharmacy Sub-section; in 1937 he was chairman of the A.Ph.A. Practical Pharmacy Section, and chairman of the A.Ph.A. Special Committee on Hospital Pharmacy Survey; in the same year he was a member of the AACP Committee on Professional Relations. He was a member of the latter committee for six years. In 1938 he was chairman of the A.Ph.A. Special Committee on Hospital Pharmacy Survey. In 1939 he was a member of the A.Ph.A. Committee on Prescription Tolerances. The year 1940 saw Louis Zopf as a member of the USP Revision Committee, a member of the NF Subcommittee on Solid Preparations for Internal Use, and chairman of the A.Ph.A. Practical Pharmacy Section. I don't know what he did in 1941, but in 1942 he was a delegate to the House of Delegates of the A.Ph.A., a position he held for two years. In 1943 he branched into journal work and was a member of the Prescription Information Service Board for the *Practical Edition, Journal of the A.Ph.A.* (for seven years) and was also a member of the Subcommittee on Pharmaceutical and Hospital Formulas for Internal Use — *Recipe Book*. Starting in 1944 Louis Zopf was First Vice Chairman of the Scientific Section of the A.Ph.A., and during the same time he was a member of the AACP Committee on Problems and Plans.

The year 1945 found Louis Zopf among the members of the A.Ph.A. Committee on Survey of Pharmaceutical Activities of the U.S. Public Health Service and chairman of the USP Subcommittee XIII on Ointments and Galenicals. In 1946 he was chairman of the A.Ph.A. Scientific Section, a member of the AACP Curriculum Committee, and a member of the USP Executive Committee. He was a member of the Curriculum Committee for six years. In 1947 Louis Zopf was the delegate from the A.Ph.A. Scientific Section to the A.Ph.A. House of Delegates and also became Secretary-Treasurer of the AACP (a position he held

for six years). From 1947-1949 he was a consultant of the American Council on Education. From 1952 to 1958 Louis Zopf was Chairman of the AACP Executive Committee, and in 1954 he was Vice Chairman of the A.Ph.A. House of Delegates. In 1950 he held membership on the committees on scope and internal preparations of the USP. Louis Zopf has served also as a member of the AACP Committee on Recruitment Aids and the Curriculum Committee of the Pharmaceutical Survey.

Dean Zopf is a member of the AMA Committee on Cosmetic Preparations; he was a Director of the American Foundation for Pharmaceutical Education from 1949-1958; he is a Faculty Fellow of the American College of Apothecaries; he is a member of the Committee on Pharmaceutical Education of the Pan-American Pharmaceutical and Biochemical Federation; he is a member of the American Council on Pharmaceutical Education. Louis Zopf holds membership in the Association of Hospital Pharmacists, American Society of Hospital Pharmacists, AAUP, Sigma Xi, Rho Chi, Beta Phi Sigma, Theta Xi, Kappa Psi (Honorary), Iowa Hospital Pharmacists' Association, A.Ph.A., Iowa Pharmaceutical Association (member of the Public Relations Committee and the Advisory Committee). He is a member of the Iowa Society of Hospital Pharmacists and the Triangle Club of the State University of Iowa.

Dean Zopf is author of over eighty papers on scientific and educational subjects. He is assistant editor of *Remington's Practice of Pharmacy* and *American Pharmacy*.

On April 22, 1958, the American Association of Colleges of Pharmacy elected Louis C. Zopf President, thus bestowing one of the highest honors in pharmaceutical education on a man who for over twenty years had served pharmacy and education tirelessly and well.

President Zopf's accomplishments are well summarized in a letter written by Dean Joseph B. Burt of the University of Nebraska to the chairman of the University of Nebraska Committee on Commencement and Degrees when recommending Dean Zopf for the Honorary Doctor of Science degree (awarded June 7, 1954). The letter included the following two paragraphs:

> Professor Zopf, Dean of the College of Pharmacy of the State University of Iowa, is a distinguished teacher of Pharmacy, a leader in pharmaceutical education, a recognized authority and consultant in the field of dermatological preparations, a productive researcher in this area, author of important monographs in the textbook literature on pharmaceutical preparations intended for external application, active in the development of pharmaceutical education in hospital pharmacy, and one of the leaders in the organization of the American Society of Hospital Pharmacists.
>
> Professor Zopf's leadership in pharmaceutical education, his studies and findings in the general area of pharmaceutical preparations intended for external use, together with his activities in improving and developing pharmaceutical service in hospitals, and his successful efforts toward the betterment of professional relations with the practitioners of medicine through active cooperation constitute major contributions to society which are judged by the Faculty of the College of Pharmacy to be fully deserving of recognition by the University of Nebraska.

In these last few years as editor of this journal, it has been my pleasure to be in regular association with our President. He is a cautious, conservative man. After all, he's a Republican *and* a Lutheran. But I have been most impressed with what seems to have impressed Dean Kuever when he lauded his ". . . excellent judgment and his ability to work with others." I have never seen him lose his temper. But this self-control is only part of the armamentarium of a smoothly operating administrator. Effective action results from studied unemotional clear thinking. Dean Zopf acts effectively; he stimulates and guides others to do the

same. His students find in him a person of warmth and understanding. But neither is he a person to discourage industry in his students. As Dean Kuever puts it, "The Dean is a firm believer in the educational theory that it would not hurt if the college worked its way through some students." His graduate students find him a prodigious worker who isn't afraid to remind them that few jobs done by dedicated individuals can be done wholly in the daylight hours! Many nights find Dean Zopf at his desk — often accompanied by his wife with a book or other wifely project. For Dean Zopf, pharmacy is a serious and consuming adventure. He lives it.

In those rare moments away from his office and pharmacy, President Zopf enjoys a vacation shared with friends. His vacation cooking runs the gamut from pancakes to buckwheat pancakes, soggy or non-soggy. As a guest in his gracious home, one finds entertainment often consists in viewing the slides that Dean Zopf has taken during his wide travels. If as a guest you don't care to see slides, he very graciously shows them to you anyway!

The Association has as its President a man of vast administrative background, a person of warmth and feeling — a true leader. He is where he is because of his ability and his earnest effort. The fitness of the AACP honoring Dean Zopf with its office of President is summed up well in the citation for his second Honorary Doctor of Science degree (from St. Louis College of Pharmacy and Science, 1958):

> Pharmacists of Dean Zopf's stature represent the armed forces of pharmacy. Armed with knowledge and inspired by professional zeal, they are fighting the battles which win the victories from which all segments of pharmacy benefit. To these men go the crowns of laurel.

LOUIS C. ZOPF

CHEMISTRY-PHARMACY-BOTANY BUILDING, STATE UNIVERSITY OF IOWA

ARTICLES

PHARMACY'S APPEAL TO PROSPECTIVE STUDENTS--WHAT THE COLLEGES ARE DOING*

LLOYD M. PARKS

If we need convincing evidence that we have been doing something less than an effective job in reaching prospective students for pharmacy in our high schools, that evidence may be found in two reports that have been called to our attention. Mr. Robert A. Hardt, Chairman of the Program Committee of the Industrial Council session on the Pharmaceutical Industry in 1955, reported as a result of that session that high school teachers and guidance counselors were quite unaware of pharmacy as a career, and that they had given little thought to recommending it for consideration by their students. Our own Committee on Future Enrollment Problems reported at this meeting one year ago that as a result of its limited survey, 75 per cent of the students entering pharmacy made their decision to do so while they were in high school, but only 4 per cent of them were influenced or guided in their decision by a teacher, the conclusion being that pharmacy as a career is being given little consideration by counselors and teachers in their high school guidance activities.

This Association, many of our member colleges, and many individuals in our colleges during the past few years have been very diligent in attempting to alert everyone to the critical situation that exists in the shortage of quality students for pharmacy. There is encouraging evidence that many people in the different fields of pharmacy are becoming finally aware of the situation and of the necessity to do something about it. When we reach the point where enough people in all fields of pharmacy are sufficiently and seriously aroused to the point that they are willing to become active instead of waiting for someone else to do the job, then we may see a well-organized and coordinated effort that will be effective. There are indications that we are arriving at that point.

Our Association is only one of the organized groups in pharmacy that is concerned with this problem. Others include the national and state organizations representing retail pharmacists, both independent and chain, and manufacturers. In addition, many state and local pharmaceutical associations and individual manufacturers are becoming active in the program. It is my purpose to point out what individual colleges of pharmacy are doing and what others can do in coordinating their efforts with those of the various national, state, and local organized groups and in supplementing their efforts.

In analyzing the problem involved in pharmacy's appeal to prospective students, it may be divided into three phases, none of which is separate and distinct, and all of which are somewhat overlapping. The first phase might be considered the problem of creation of interest in pharmacy as a career and the desire to learn more about it. The second is the satisfying of that interest by furnishing information on the opportunities in pharmacy. The third and decisive phase is direct

* Presented to the AACP, Los Angeles, California, 1958.

personal contact with those interested quality students who have been reached in the first and second phases, with the aim of convincing them that they have a future in pharmacy.

The creation of interest in pharmacy as a career lends itself well to mass media appeal on a national as well as a state level, and some excellent efforts have been made with encouraging results. Among these have been the inclusion of the brochure *Shall I Study Pharmacy* in the guidance packets mailed to more than 20,000 members of the National Science Teachers Association in our high schools, the advertising program in newspapers of the National Association of Chain Drug Stores, a similar advertising campaign in certain magazines by the NACDS and some manufacturers, and the sponsorship of television and radio programs as a public information and appreciation service for pharmacy by some manufacturers. The results obtained from all of these indicate that we should encourage their continuation and intensify the effort in this type of appeal. Newspaper and magazine advertisements on pharmacy as a career, which include a coupon to be filled out and returned for further information, provide an excellent way of obtaining names and addresses of interested students which can then be furnished to our member colleges for further personal contact. Spot announcements at frequent intervals on radio and television are another type of mass appeal that has been relatively untouched in pharmacy, and a program of this type should be encouraged. None of these mass-media types of appeal should be considered a one-shot proposition; they should be repeated at frequent and continuing intervals.

Many of our member colleges have been active in this phase of the program, as well as in the second phase of furnishing information on the opportunities in pharmacy. As reported earlier by Dr. Deno, the Committee on Recruitment Aids has assembled information on what the colleges are doing in their recruitment programs; this information is worthy of comment as an example of what others can do in this regard. Several of our colleges, either alone or in cooperation with their state or local associations, have presented radio and television programs on pharmacy, using free public service time that is made available to them. One reports that it has advertised in more than 100 high school papers and in nine metropolitan papers in its area. Another reports that it is cooperating with the drug traveler auxiliary, its state association, and the wholesalers in its state in the preparation and distribution of a pictorial poster on careers in pharmacy to be displayed in high school science rooms, pharmacies, bank lobbies, department store windows, and similar places. Other colleges report that they sponsor a pharmacy display at the science fairs in their area; one arranges to have the science fair in its own building; and a few colleges prepare and man pharmacy booths at the state fair, where they answer questions and provide pamphlets on career opportunities in pharmacy.

Many of the colleges, either on their own or in cooperation with other colleges of pharmacy in the state and the state association, have purchased the two recruitment films for circulation and have made mailings of the brochure *Shall I Study Pharmacy* and other pamphlets, to all of the high schools and libraries in their states. Some mail their college bulletin and brochures to all high schools in the state; others have made similar mailings to all other colleges and junior colleges in their state; a few have prepared special pharmacy information kits and sent them to the high school guidance counselors in their state; and a few others have prepared a colored slide and tape recorded story about pharmacy in their college for regular circulation to the high schools in their state.

By way of a more personalized approach to the problems of creating interest and providing information, many colleges are furnishing speakers from their staffs for career day programs at high schools in their areas, for high school science clubs, and for lay audiences such as service clubs, church groups, and PTA groups. Others are cooperating with their local and state associations in encouraging the promotion of and furnishing personnel for speakers bureaus. Many are depending on the practicing pharmacists in their state to appear on high school programs, and are furnishing these pharmacists copies of the Pharmacy Study Portfolio for their use on such occasions. Some are mailing copies of their college bulletins to every retail pharmacy in the state; others have mailed the Pharmacy Study Portfolio to selected groups of pharmacists and alumni of their colleges in an effort to solicit their cooperation and assistance. Some colleges have had success in bringing groups of high school counselors to the campus to visit their college; others have provided their senior students with packets of informational materials on pharmacy to use in a personal call upon the guidance counselor in their home-town high school.

Some of our colleges of pharmacy, recognizing that an ever-increasing source of students under the forthcoming five year program will be in the liberal arts and junior colleges in their state, have concentrated their efforts on these institutions by mailing their college bulletins and career literature, as well as by personal visitations to the officials and guidance counselors of these other colleges. Some have even been successful in arranging for these liberal arts and junior colleges to include a two year prepharmacy curriculum in their catalogs while others have been successful in arranging for visits by the prepharmacy advisors and counselors in these institutions to the college of pharmacy.

An opportunity for our colleges to coordinate their efforts with the national appeal may be found in the information supplied us on the showing of the two recruitment films. Each member college regularly receives from Secretary Webster a listing of the schools in its state which have shown or have booked for showing one or both of the films, *Design for Life* and *Time for Tomorrow,* as supplied from the central booking agency. Some colleges have followed up this information with a letter to the high school official who booked the film, offering to provide him with additional career guidance literature, and offering their assistance in arranging for a speaker on pharmacy for a career-day program.

Another form of personalized approach rests in the opportunity and the obligation to inform the high school teachers and guidance counselors on the field of pharmacy. We have heard, as a result of the session on the pharmaceutical industry three years ago, and again at this meeting *(Editor's Note: See succeeding article)*, that the high school teacher and counselor does not have the information about pharmacy and its opportunities that we would wish him to have. There is doubt in my mind that the mere mailing of career literature is the most effective way of handling this problem. High school counselors, like all of us, are besieged by mailings and literature which they do not have time to read unless their interest is particularly stimulated. I believe, however, that most of them would be willing to give up an evening of their time to listen to an educational program on pharmacy.

Here is an excellent opportunity for the colleges of pharmacy to work in cooperation with their state and local associations on a mutual problem. Many states are well organized into local associations which cover every area of the state. By working with the local association the college of pharmacy can cooperate in presenting such educational programs for groups of guidance counselors in

any particular area of the state. Members of the local associations can be encouraged to schedule the meetings and bring the guidance counselors in their community to them, and the college staff can cooperate in putting on the program. I know from personal experience with this type of program that it is appreciated by the local pharmacists and is very well received by the guidance counselors. As a result, their interest in pharmacy is stimulated, they receive accurate and favorable information on the various fields and opportunities in pharmacy, and they are better equipped to explain and recommend its consideration to their high school students.

In my opinion, all of these more personalized approaches to the problem of creating interest and furnishing information on opportunities in pharmacy are well worth the effort, and they are the least that we in the colleges of pharmacy can do and must continue to do in this problem. It seems to me, however, that we must do even more than this, and that we have our best opportunity to do an effective job in the third phase of the problem, namely, personal contacts with those selected quality students who have expressed their interest in pharmacy as a result of the efforts expended in the first two phases. Moreover, all elements of the first two phases should be designed as far as possible to result in the accumulation of actual names and addresses of students who have expressed an interest in pharmacy — individual students who can then be contacted directly by the colleges.

One of the best features of the advertising campaigns sponsored by the National Association of Chain Drug Stores and by at least one manufacturer during the past year was the coupon which could be filled in and returned to the sponsoring organization. The information thus obtained, when sent to the colleges of pharmacy in the various states, provided those colleges with names and addresses of students whom they could then contact. This idea should be incorporated into every phase of the program which reaches high school audiences. Colleges of pharmacy, in their contacts with the high school counselors, should encourage the latter to provide them with the names and addresses of students who have expressed an interest in pharmacy. The colleges should also make arrangements with state and local associations and with individual pharmacists who appear on high school programs to have all of these speakers provide the college with this same information. Some colleges have done this very effectively by the use of a stamped and addressed post card, which can be filled out and dropped in the mail.

The colleges of pharmacy in one state, where apprentices may be registered prior to their enrollment in college, receive each year from the secretary of the state board of pharmacy a list of the names and addresses of those people who have registered as apprentices during the past twelve months. After screening this list and eliminating from it the names of those students who are known to be enrolled either in prepharmacy or in one of the colleges of pharmacy in the state, the remainder of the list furnishes an excellent source of interested and prospective students for pharmacy with whom the colleges can then make direct contact.

Once this opportunity to establish direct contact with students by name is available, what can the colleges do with it? Certainly the least that can be done is to send each student a personal letter, a copy of the college bulletin, and other literature on the career opportunities in pharmacy, and to offer the services and advice of the college to him in making his decision whether to study pharmacy. A cordial invitation to visit the college is also the minimum to be expected.

One of the most helpful programs, from the standpoint of the student, and one which is being adopted by many colleges, is to plan a Pharmacy Day program or an Open House, to which these students are sent invitations. This provides the student an opportunity to visit the campus, to see the college of pharmacy in action, to see what study in a college of pharmacy is like, and to talk to pharmacy students. High school students are frequently more impressed by what they hear from college students than they are by what they hear from college professors, and this opportunity for them to mix and visit with the students in the college of pharmacy should be afforded them.

Some colleges have also attempted with some success to tie in this personal contact with an alumnus or an outstanding pharmacist in the area of the state where the student lives, by asking that pharmacist to make a personal call on the student and also urging him to bring the prospective students in his area to the open house program. This same procedure is followed by some colleges with all letters of inquiry received from prospective students; when it receives the cooperation of the local pharmacist, the result is usually quite effective.

Another aspect of the appeal to prospective students will assume more importance as colleges of pharmacy enter into the five year program. In most cases, entering freshmen will be taking one or two years of prepharmacy work while enrolled in the liberal arts college before they are admitted to the college of pharmacy on the same campus. In planning for this, colleges of pharmacy would be well advised to arrange for their own staff members to serve as faculty advisors to these students during their prepharmacy years on the campus. If this is not done there is the possibility that the interest of some of these students may be diverted, either involuntarily or otherwise, to other fields, and they may be lost to pharmacy. On the other hand, a well-advised prepharmacy student not infrequently becomes a strong booster for pharmacy among his fellow students in the liberal arts college.

In conclusion, the problem of making an effective appeal to prospective students for pharmacy is one that must be accomplished largely on a state and local level, and through individual effort. Programs may be organized on a national level, and effective recruitment aids may be furnished from a national source. But the essential exploitation of the interest thus stimulated must be done by the colleges of pharmacy in cooperation with the groups in their own states and areas. In this regard, retail pharmacists particularly, in their contacts with prospective students, should be encouraged to inform them about the activities and opportunities in all fields of pharmacy, and not to restrict their discussion to retail pharmacy alone. We would all be well advised, in our encouragement of practicing pharmacists to cooperate in this program, to be certain that those who are selected will emphasize the positive and not present pharmacy in a negative or unfavorable light. Our colleges of pharmacy which depend upon the central university recruitment officials to present opportunities in pharmacy in their contacts with high schools should also be aware that such people may be something less than enthusiastic in their own attitude toward pharmacy if they are not properly and accurately informed on the field.

Our efforts in a quality recruitment program for pharmacy cannot be intermittent; they must be continuous. I am somewhat concerned when I listen to discussions about the shortage of retail pharmacists and arguments over whether it is a shortage or a maldistribution. I believe that too much of the present-day concern over such things as shortages, maldistribution, and replacement factors

is causing us to restrict our sights too closely to the retail field with the assumption that pharmacists in the future will be doing much the same things and in the same proportions of the total pharmacy manpower as they are doing today. In my opinion there will never be an overabundance of *good* pharmacists; the need for them, both now and in the future, will be not only in retail pharmacy but also in the many nonretail areas in positions which should be manned by pharmacists but for which pharmacists are not now available. This demand for pharmacists in areas other than retail will increase as the products of our improved educational requirements become available, and the placing of pharmacists in these other areas can only result in the improvement of the prestige and professional status of pharmacy in the eyes of the public.

Health education involves . . . on the part of the teacher and the pupil . . . controlled experimentation, rechecked observation, repeatedly verified cause and effect relations. It is the development of the skill in finding "facts", the use of reason based on facts rather than an exercise of faith based on unverified dogma.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 291 (1941)

PHARMACY'S APPEAL TO PROSPECTIVE STUDENTS*

DAVID REISS

I feel far from being an expert on why people do not go into the occupation of pharmacy. In fact, I can recall a definition of an expert that was given to me recently at the University of Southern California. Some of you may be from that institution. This gentleman defined an expert as follows: ex stands for a has been and the "spurt" is a little drip under pressure.

I also feel in a peculiar position this morning because of the letter I received a month or so ago which said, "When you get up in front of this august group, really pour it on; tell them about it."

I am afraid most of my talk is going to be on the negative side. Let me disillusion you immediately by telling you I do not have the answer: I cannot tell you why people, high school students, do not go into pharmacy; but I can tell you some of the things that are being done which are more or less the negative approach.

To give you an idea of what the average high school does in vocational guidance — and I will make my story brief — I will use our particular school as an example. It is a high school of 1,700 students from a fairly high economic level. By fairly high, I mean many of the kids coming to our school come from homes that have swimming pools.

We also have (I think this is on the positive side of our particular school) a tremendously large number of students that go on to college. I think the average for the nation as a whole is somewhere around 28 per cent of the graduating class. We exceed this by a considerable number. Since the beginning of our school in 1951 and since our first graduating class in 1954, we have consistently had between 50 and 60 per cent of our students going to a two year or a four year institution. In those four graduating classes we have never had a student go into pharmacy.

I thought perhaps something was wrong with our particular school. As Director of Counseling and Guidance, I took this as a personal affront; there must be a reason, I said, why people do not go into pharmacy. But, lo and behold, a week or so ago I checked with the neighboring high schools and out of a total of roughly 2,100 seniors, representing about eight different senior high schools in and around Inglewood, including Greater Los Angeles, three students were going into pharmacy. Of the three the director of counseling of the particular school would recommend only one. The other two did not have the qualifications. That is to me a rather sad state of affairs. I can sympathize with the problem, and believe me you have a problem.

I was at one time a pharmaceutical chemist before I went into education. Perhaps I could supply several answers to the question of why people are not going into pharmacy. I think they could all be summed up into one thing — lack of knowledge about pharmacy as an occupation.

The image of the pharmacist in the minds of parents is still the pharmacist of twenty-five to thirty years ago, and the image of the pharmacist in the minds of parents of high school students is still of the retail pharmacist. Very few

*Presented to the AACP, Los Angeles, California, 1958. Transcript of stenotyped notes prepared from talk.

people seem to know — and this is hard to accept, I know, for you people in the occupation — the various aspects in pharmacy. There are pharmaceutical chemists, there are manufacturing pharmacists, and there are research pharmacists. Yet this knowledge does not get across to the people to whom it should. There have been recent attempts by pharmaceutical associations to do something about that. Perhaps the gentlemen who had a hand in putting out two pamphlets may be in the audience. I hope I don't hurt their feelings. One pamphlet is called *Look to Your Future in Pharmacy, the Field of Unlimited Opportunity* and the other pamphlet, *Shall I Study Pharmacy*. Both are very well written, but then (again this is strictly my own personal feeling) they do not reach the high school student. At the risk of using a bad word, they are not *glamorous* enough.

Let's not overlook the point of view that glamor has its place in proselyting people into occupations, and I do not hesitate to use the word "proselyting." It has a definite place. You can still make things glamorous and be professional about it. I don't mean you have to go out almost like the coach of a football team and beat the bushes to get people to come out for a particular team.

Let me sidetrack for a minute and tell you about a few things we do in vocational guidance — my first premise. Starting in the eighth grade, which is on the junior high school level, we have a unit on careers. At that particular time the students explore the very broad field of work but not in detail. In the tenth grade there is a follow-up, and in the senior year the program is climaxed by our career day which we use in the spring semester.

During all of this period of time, there is also an extensive testing program. There is a Kuder preference test given, aptitude tests, the usual I. Q. tests, and the usual achievement tests, so we have something specific to go on in guiding a student, at least negatively, and most guidance, incidentally, is negative. We usually tell people what they cannot do and seldom positively say what they can do. This in a nutshell is what our vocational guidance consists of.

During the time this is all going on, we do not and never can at any one particular time push any one occupation over any other occupation. Our job as so-called vocational guidance counselors is to make the materials available to the students and try to answer their questions about them.

It is interesting to note a recent study — and I brought it along with me; don't feel alarmed, I am not going to go through the materials I spread on the desk. It is only for moral support, as it always makes me feel better to see it there. This study lists the things which interest people in going into occupations: 32 per cent listen to families; talks by people in different occupations, 48 per cent; visits to plants, 4 per cent; motion pictures on occupations, 6 per cent. You draw your own conclusions.

Notice again the 48 per cent listing talks by people in different occupations. At the risk of passing the buck, it is interesting to note what particular group or groups have the most influence on young people in making the choice of a career: parents, 41 per cent; friends, 14 per cent; work experience, 13 per cent; printed material, radio, TV and movies, 9 per cent; teachers, 8 per cent. I won't list the others. I feel rather bad that teachers are at the bottom of the list.

The very large group of people who have the greatest amount of influence on our young people are the parents. Even TV is listed above and beyond the influence of the teachers or the influence of the school.

I could go and tell you what we do in science for our students. There are a great many things. One could mention the Science Fair and science includes

pharmacy. The Science Fair is now open at the Los Angeles County Museum, which isn't too far from here. It is open to the public. I suggest if you have never seen one that you take the trip down there today. You will be amazed to see what young people can do, and you will also be amazed to know that out of the 85 sponsoring organizations (maybe you won't be amazed), no pharmaceutical association is listed as one of the sponsoring groups. Engineering concerns, engineering councils, the Medical Association, the American Chemical Society, the American Physics Society — yes, they are there, but you won't find anything about a pharmaceutical group in it. Remember again you must interest young people.

We send people back each year to two places on the East Coast, the Worcester School of Experimental Biology and the Roscoe Jackson Memorial Lab, where they have a chance to find out a great deal about research.

We have a Scientist of Tomorrow program that is going to be held at the University of New Mexico the latter part of June, sponsored by — you guessed it — the Engineering Council. This is supposedly a science program, but you know where the pitch is going to be. It will be in engineering.

I mentioned our career days. I mentioned a great many devices, but let me sum up. Why can't we have open house in the schools of pharmacy? I ask this as a question, because in my time in education I have never received an invitation to send any people from our school to an open house where they have a chance to see what is going on. Why can't we have a meeting of groups of students with people in pharmacy to explain to them what the educational requirements are, what the work requirements are, what the hours are, what the starting salary is? Why can't we have letters from schools of pharmacy asking for the names of graduating seniors who are interested in pharmacy? Then why can't the schools of pharmacy contact these people similarly to what is being done in other areas?

Why can't the pharmaceutical associations co-sponsor the Science Fair? Why don't we get phone calls from retail pharmacists asking permission to come to our campus and speak to our chemistry classes? We have never turned down a request yet.

Why can't we have chances for our young people, seniors, to get some work experience at a retail pharmacy where they can get a better idea of what is going on? Why can't we have attractive posters or any posters? There is nothing like a visual aid. I don't know of any in pharmacy, or even of any pamphlets that are written a little bit more directly for people on the high school level.

He was "deaning" for over a quarter of a century, and at the end he was still a human being.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 290 (1941)

PHARMACOGNOSY TRENDS*

JAMES E. DUSENBERRY

In his paper on "The Objectives and Scope of Graduate Study in Pharmacognosy," Heber W. Youngken, Jr., states:

> Unfortunately published research among pharmacognosists in this country is not extensive in terms of the number of persons in the field who should be contributing. The troublesome fact is that although pharmacognosists in America have long claimed the products, structures, and certain phenomena of nature to be chief interests, relatively few of them have reported the results of scientific investigations in the subject. Indeed, much of this has been left to workers in allied fields who righteously have common interests in much that we as pharmacognosists would also call germane to our special interests (1).

The reasons may not always be apparent. It may be due to one or more of several contributing factors. In many schools the instructor in pharmacognosy may not be a pharmacognosist and is without adequate background. He may be burdened with a very heavy teaching load and little or no assistance in his instructional laboratory work. In many instances it is probably due to lack of assistants or technicians — graduate students or otherwise — to aid in the pursual of the problem.

In other instances it may be due to a certain amount of inertia on the part of the instructor. He doesn't have the monies necessary to support the investigation of the problem that he has been carrying around for years in the back of his mind, and possibly he doesn't feel adequately familiar with some of the newer techniques.

It should be recognized that there have been many important contributions made in pharmacognostic research by pharmacognosists and supporting research institutions. Where pharmacognosists are not permitted the time or the funds to carry out this research, however, the institutions employing them should recognize their responsibilities in providing the means and time to support such investigations.

It is true that there has been a period in the recent past when there was a lag in interest in pharmacognosy due to the increased efforts in synthesis and the trend away from the natural products. Beginning with the advent of the antibiotics and the refinement in the physiological and pharmacological aspects of drugs there has been a renewed interest in problems related to the natural drug products.

From these so-called transitive periods of scientific interest, and from the accompanying progress made in various fields of scientific endeavor, many new research methods and techniques were forthcoming.

The majority of the people in pharmacognosy were unable to keep abreast with these advances, probably because the techniques were largely developed in areas outside the field of pharmacognosy. Consequently many workers in areas where these techniques were developed, or investigators in scientific disciplines that did keep abreast of these developments, did not hesitate to use them in problems that should fall in the realm of pharmacognosy.

Among these research methods or techniques with which we are all familiar, at least by name, are radioactive isotopes, chromatography, tissue culture, etc., together with the new and refined advances in instrumentation.

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*Presented to the Section of Teachers of Biological Sciences AACP, Los Angeles, California, 1958.

RADIOACTIVE ISOTOPES

The availability of radioactive and stable isotopes has stimulated considerable research in many diversified fields of science, for basic research purposes and the preparation of labeled drugs for use as therapeutic agents.

For us in pharmacognosy it has provided a new and exceedingly delicate research tool. The greater sensitivity of the isotope tracer technique makes possible the detection and measurement of radioactive metabolic intermediates and end products in plant metabolism.

Data have been obtained from *in vivo* and *in vitro* techniques showing that the atropine moieties are synthesized in the root and in darkness, provided chemical substrates are available.

Tumors which have been induced to develop on intact plants by inoculations with the crown gall bacterium, *Agrobacterium tumefaciens,* have yielded at least 25 per cent more atropine than have comparable tissues on a dry-weight basis. Radioactive atropine was obtained from labeled glucose when the sugar was infiltrated via the leaves of plants grown in darkness (2).

Labeled bufagin has been produced by feeding radioactive algae to the tropical toad (3) and also by administering labeled cholesterol (4).

To introduce a labeled element (radioactive C^{14}) into such drugs it is necessary to employ biosynthesis. This is commonly done by placing a growing plant in a sealed container and supplying the radioactive carbon as $C^{14}O_2$. The plant assimilates the labeled carbon, and after a period of time the plants are harvested and the desired compounds are extracted and purified.

Among those drugs, to date, where radioactivity has been introduced into the molecule are digitoxin, morphine, nicotine, atropine, podophyllotoxin, colchicine, ergot, and bufagin. In the area of synthetics isoniazid (isonicotinic acid hydrazide) and para-aminosalicylic acid have been studied (5, 6).

Other interesting studies include the study of phenylalanine as a precursor of the alkaloid hordenine in the barley plant (7). Gramine isolated from the shoots of barley was not radioactive, and it was concluded that phenylalanine was not a precursor of the indole nucleus in barley, or at least of the tryptophane, since it is known that tryptophane is the precursor of gramine.

Digitalis purpurea in hydroponic culture has been shown to incorporate labeled acetate in varying amounts in the glycoside fraction (8) while the alkaloid fraction of parasitically grown ergot was shown to incorporate at least a portion of the labeled carbon dioxide in its alkaloids (9). In the biosynthesis of ergothioneine by *Claviceps purpurea* in saprophytic culture it has recently been shown that there was no incorporation of 2 (Ring)^{14} C histamine into the isolated histidine or ergothioneine, but probably the sulfur of methionine was incorporated in the synthesis of ergothioneine (10).

Certainly the literature now contains enough background material to stimulate further work designed to determine the site of synthesis, the fate, and the biogenesis of innumerable other metabolic products of plants.

CHROMATOGRAPHY AND ELECTROPHORESIS

Chromatography and electrophoresis have opened up new fields in pharmacognostic research as well as in the other areas. Chromatography developed so rapidly in the past two decades that it is now to be regarded as one of the most powerful tools available for the separation and purification of natural products. The variety of techniques developed since Tswett's separation of leaf pigments

by elution analysis has been extensive. It has only been in the last decade or so that application of these various techniques of chromatography began to find its way into research undertakings in the field of pharmacognosy in this country.

By many it was considered to be a novelty rather than the extremely useful tool that it has proven to be.

Today, however, everyone realizes the necessity of becoming acquainted with the general chromatographic procedures because we find no less than twelve monographs in th USP (11) and eight in the NF (12) where assays and/or identifications are conducted by these methods. This number will no doubt grow with forthcoming compendia. It would not be in the scope of this paper to attempt to cite even a good representative sample of the variety of applications that have been reported in the past year alone.

In chromotography recent progress has not so much been the number of new procedures that are being introduced, but the refinement of techniques already known. For instance, ammonium formate added to formamide to impregnate papers apparently results in a better separation of organic bases (13). Another refinement is the treating of chromotographic and electrophoretic strips with improved agents to produce a better transparency in paper for quantitative analysis with a densitometer (14). Previously used oily materials and lacquers had numerous disadvantages. You rarely see a scientific journal today without a reference to anything from chromotographic detection of heretofore unknown components in the glycoside complexes of *Digitalis purpurea* (15) to the separation of serotonin from bananas (16).

Whereas electrophoresis has long been a powerful tool in the laboratory for separating blood proteins, colloids, amino acids, and other complex mixtures of electrically charged particles, relatively few papers are concerned with this technique in pharmacognostic research.

A rather recent *Bibliography of Electrophoresis* (17) indicates that little work has been reported on medicinal plants. Migration rates of alkaloid-bearing crude drugs extracts and authentic alkaloids have shown a remarkable degree of similarity (18). This technique might well lend itself to a variety of researches with drug plants.

Various procedures are now available in continuous and preparative electrophoresis for obtaining sufficient workable quantities of the components of a mixture (19, 20, 21).

Mention should be made at least of the excellent technique of gas chromatography. While the original columns only permitted the separation of materials with low boiling points, the elevated temperatures obtainable in the newer columns permit the separation of even the long chain fatty acids (22, 23).

It represents a superlative method of separating small amounts of volatile materials (24). Not only can quantitative recoveries be made of the lower boiling fractions, but a pen recorder provides a permanent record of the emergence of each substance as indicated by the form of a peak whose area is proportional to the molar quantity of the substance. It is extremely useful for determining gross differences in a number of similar volatile oils (25).

PLANT GROWTH REGULATORS

Probably no other plant growth regulator has received more attention than that group of chemicals called the gibberellins. They include a number of related chemical substances produced by the rice fungus *Gibberella fujikuroi.*

The gibberellins are a striking example of the expansion of biochemical knowledge relating to human and animal health to include plant biosynthesis.

Only in the past year or so has this group of chemicals emerged from its status as a laboratory curiosity to its present position of securing considerable attention from a technological and economic point of view. While the cost of these chemicals has been reduced it should be remembered that gibberellins can be produced in small quantities in the laboratory by a submerged fermentation method (26).

It is significant that this group of chemicals seems to bring about a "triggering" effect on already established mechanisms (27) rather than initiating abnormal types of cell division.

In 1956 the biennial *Hyoscyamus niger* was reported to have been induced to bloom the first season without previous cold or long-day treatment (28).

In gibberellin treated *Xanthium pennsylvanicum,* one of the best-known short-day species, all plants showed increased growth. These plants retained continuously in long-day treatment remained strictly vegetative whereas only those exposed to several photo-inductive cycles developed flower buds (29).

A long list of responses has been reported (30), but in brief the gibberellins are said to make plants grow faster, reverse dwarfism, break dormancy, provide more rapid flowering and setting of seed, induce accelerated seed germination, and increased fruit set.

While only limited research on medicinal plants has been reported, it appears that development of many of the potentials of the gibberellins should promise interesting research in your drug garden.

TISSUE CULTURE

In the course of research undertaken during the past two decades, and especially has this been true of many phases of biological research, it has often been necessary and desirable to carry out experiments with minute quantities of material.

Tissue culturing is one such experimental method. An outstanding researcher in tissue culture, Phillip White, said,

> Every cell in a body has a dual character. First there is a fundamental character which arises from the innate qualities of the cell itself; this cannot be altered without destroying the cell. Then there is a more ephemeral character which arises from the fact that the cell is imbedded in a complex environment which includes millions of other cells; this can be changed without necessarily destroying the cell. The first qualities are personal, so to speak, the second social.
>
> So long as a cell remains in its normal place in the body it is difficult or impossible to distinguish between its personal and social qualities. If, however, a cell is removed from its usual surroundings and placed in an environment which, though asocial, is sufficient for survival the social aspects of its character fall away, and we can discover not only what is the real individuality of the cell, but also just how the social factors have affected it. Cells or tissues so isolated are tissue cultures (31).

If the cells or tissues are placed in a nutrient medium that contains all the salts, carbohydrates, vitamins, and other substances, they will multiply. In this manner the individual character of the tissues can be observed, and they can be manipulated to determine precisely these variants of nutrient, temperature, acidity, etc., that are needed to elicit roots or leaves or woody deposits. Also, we can study even the metabolic products.

Using these techniques we have grown and studied many plants and isolated plant parts in the past few years. Many things have been learned. For instance, one would think it logical to assume that stem tissue and root tissue from the same plant would grow using the same nutrients, but this is not so. Stem tissues have

been shown to require something more. This something more is indoleacetic acid. The role of this auxin and others is better understood because of these methods.

The tissues of certain plants have been used to study the behavior pattern of other parasitic plants like the downy mildew *Plasmopara viticola,* which otherwise could not be grown in the laboratory.

The permutations of behavior patterns and of nutritional and other environmental requirements are almost endless, as are the potentialities for use and study of these cultures.

Another important application of these cultures is in the study of cancer. Tumors and cancers are parts of the body that have escaped from the social restraints characteristic of normal growth. In setting up tissue cultures restraints are deliberately removed. Therefore, normal tissues have been transformed into something possessing certain important resemblances to tumor tissues. These resemblances are artificial, and it is known how they have arisen. Thus it is possible to understand some of the processes by which tumors may arise in nature. Moreover, it provides a technique by which the tissues of plant tumors that occur in nature can be studied in the laboratory. Plants develop many different sorts of tumors, representing all the major types of cancers found in animals. Thus, in the laboratory it is possible to grow hereditary tumors, tumors caused by viruses, chemically induced tumors, tumors caused by organisms such as bacteria, and still others whose causes are not known. The tissues of all of these can be grown in the laboratory. One of the facts learned by this means is that at least two groups of plants tumors are sterile, yet are capable of producing new tumors upon transplantation into healthy plants. Thus they possess qualities analogous to those responsible for the malignancy of cancer cells in man.

They have been able to learn a great deal about the steps involved in the production of these tumors. For example, tumor tissues, unlike normal ones, do not require externally applied auxins. If bits of normal tissue are placed beside bits of tumor tissue, the normal tissue will grow even without auxin in the nutrient. This suggests that the tumor tissue excreted auxin in quantities sufficient to permit the growth of neighboring normal cells. Other experiments confirm this. Slices of chicory placed on moist sand will ordinarily form buds on the upper surface and roots on the lower, but production of buds can be suppressed by applying auxin paste to the upper surface or by grafting bits of tumor tissue on the surface. In other words the tumor tissue can substitute for the auxin paste. All of these bits of evidence indicate that tumor tissues must produce auxins and that one of the changes a normal plant cell undergoes in becoming a cancer cell is an increase in its ability to manufacture auxins.

There are many reminders in the current literature that the *in vitro* cultivation of tissue cells is playing a more and more important role in the solution of major biological problems.

CONCLUSION

Perhaps we in pharmacognosy have not developed a sufficient "research attitude" in ourselves and in our students. While our concepts and visions may far outrun that which we can actually attain in practice, we have not been cognizant enough of the innumerable research methods available to investigate the materials in our domain. We must of necessity become better acquainted with and master these new techniques because one tends to apply to a research problem those methods with which one is most familiar. If we hesitate to take the time to learn

new methods we may never apply them, because of our "inertia of ignorance."

A well-known English pharmacognosist said that our investigations should avoid hasty conclusions such as have occurred in the past with ergot, senna, digitalis, etc., where the discovery of a well-defined chemical or pharmacological entity has led to the assumption that the rest of the crude drug was "ballast." "Such hastiness may make us guilty of throwing out the baby with the bath" (32).

Our research should be characterized by a well-meditated conception of experiment as well as intellectual conception. Only in experiment can a mental process assume concrete form, and the experiment leads to new ideas which, in turn, give rise to new experiments.

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Preventive medicine is the natural child of fundamental medical research and social statesmanship.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 294 (1941)

RECENT ADVANCES IN PHARMACOLOGY RESEARCH*

JAMES R. WEEKS

When I was invited to participate in this program, the topic suggested was "A Survey of the Progress in Ideas, Methods, and Applications of Research in Pharmacology in the Past Few Years." Accordingly, the subject matter I am about to present may be a little different than you may have envisaged from the title. It will not be a review of the latest drugs to come into use, but instead I am going to step out of character awhile and present a few pages of contemporary history in the advance of pharmacology.

James B. Conant, in his little book, *On Understanding Science*, points out that history shows that tremendous spurts in progress of various sciences are always connected with the development of new techniques or the sudden emergence of a new concept. Pharmacology is indeed an excellent example, since it draws upon all the other biological and physical sciences for tools and methods, claiming only interpretations and applications. Since research in pharmacology, as in all sciences, is advancing at a rapid rate in many directions, in the time available I must be very selective. Since I am neither sage nor prophet, what I shall say is only my current personal opinion. I have selected three research areas as examples: (1) psychopharmacology, drugs affecting behavior and mental diseases, (2) polypeptide agents, and (3) clinical pharmacology, factors peculiar to the testing of drugs on humans.

PSYCHOPHARMACOLOGY

Drugs Affecting Behavior and Mental Diseases. The use of drugs for the treatment of mental diseases has received tremendous publicity in both medical and lay circles, although it is debatable just how much pharmacology has had to do with its development. Certainly, the potentialities of good to the public and of profits to those manufacturers who develop successful drugs are very great. Most of this activity received its impetus from the empirical discovery that reserpine and chlorpromazine were useful in ameliorating symptoms of certain mental diseases characterized by agitation, although they were first introduced as an antihypertensive and anti-emetic, respectively. Once it had been demonstrated that there were such useful drugs, the search for better ones started. Preliminary investigations were conducted on animals. Here pharmacology was confronted with a fundamental obstacle, the lack of animals with psychoses comparable to those in man. But, since mental diseases, crudely speaking, consist in abnormal behavior, and drugs were desired to change behavior back toward normal, research turned toward drug modification of animal behavior. A wedding followed of pharmacology with another science, experimental psychology. So we now find experimental psychologists and their techniques in the field of pharmacology.

Experimental methods for evaluating drug-induced behavioral changes are many, some of them apparently ranging far afield from mental diseases. Thus, they extend from observations on Siamese fighting fish to the more common techniques of modifying responses to various motivating drives and conditioned reflexes in laboratory animals as rats and monkeys. Let me describe briefly one

* Presented to the Section of Teachers of Biological Sciences, AACP, Los Angeles, California, 1958.

of the commoner experimental methods involving conditioned reflexes. A rat is placed in a box. Then a buzzer is sounded for a short time, at the end of which he receives an electric shock. In the box is a bar which, when pressed, will shut off the buzzer and shock. After a while the rat will learn first to escape the shock by pressing the bar, and then, by being conditioned to the sound preceding the shock, will press the bar when the buzzer starts, thus avoiding the shock entirely. This is called "conditioned avoidance." A trained rat will avoid the shock by bar-pressing over 95 per cent of the time. Next give a drug, such as chlorpromazine, to this rat, and he will lose his conditioned avoidance; *i.e.*, he pays no attention to the warning buzzer, but waits until he is shocked before pressing the bar. Of course, a higher dose, almost "knocking him out," could interfere also with bar-pressing.

There was another fascinating ramification of behavioral studies on drugs which brought the neurophysiologists in with the pharmacologists. It was an attempt to determine the precise site of action within the brain of these drugs, and the nature of the changes induced. One technique involved implanting fine wire electrodes in specific portions of the brain. (A monkey with a multiple socket permanently mounted on the top of his head is a bizarre sight, reminding me of a robot with a radar dome!) Such electrodes pick up the electrical activity of specific parts of the brain, and the changes induced by various stimuli or situations can be studied. Drugs, then, may modify these reactions or even induce electrical changes themselves.

Interesting as these methods are, I would like to inject one word of caution. At present, these are nothing more than novel and interesting experimental techniques, certain to increase our knowledge about the functions of the brain and actions of drugs, but they will not necessarily lead us directly to new drugs for the treatment of mental diseases. The precise changes which take place in the functions of the brain in mental diseases are not yet known, so we do not know whether the observed changes in animal behavior, or electrical activity of the brain induced by drugs, are a measure of possible usefulness in mental disease, or are just coincidental, unrelated, pharmacologic actions. In time, when promising drugs from animal tests have been evaluated in the clinic, we will be able to tell whether our animal tests are reliable for predicting clinical usefulness.

POLYPEPTIDE AGENTS

There are numerous polypeptide substances, mostly hormones, which exert powerful actions on the body. For example, all of the pituitary hormones, both anterior and posterior, insulin, and the most powerful substance known for raising blood pressure, angiotonin, are all polypeptides. Likewise a number of important antibiotics, as polymyxin and bacitracin, are polypeptides. The action of most of these substances on the body has been well known for many years, but, because of the difficulty in determining the exact chemical structure of peptides, other than the various amino acids present, little further progress was made. In recent years, however, new methods have opened wide fields for the preparation of new synthetic drugs and a better understanding of the substances themselves. I am referring to the determination of the structural formulas, or at least the amino acid sequences, for these substances. Indeed, for three of these polypeptides, the two posterior pituitary hormones, vasopressin and oxytocin (known more by their trade names Pitressin and Pitocin), and the powerful vasoconstrictor angiotonin, total chemical syntheses have been accomplished. Synthetic oxytocin is commercially available (Syntocin, Sandoz).

Several new techniques have led to solution of this problem. The first essential in starting to study structure is having an absolutely pure, homogeneous material, very difficult to obtain with peptide materials since they may partially break down in the processes of extraction. The use of the countercurrent distribution principle solved this problem. Countercurrent distribution, in principle, is very simple. All you need are two immiscible solvents, for example, chloroform and water. Also the desired compound must be more soluble in one than the other. Let us assume our desired compound is more soluble in chloroform than water. Put the solvents into a separatory funnel, add the compound, and shake. The compound will distribute itself according to its relative solubility, or partition coefficient, most of it in the heavier chloroform layer. Now visualize this funnel in the middle of a long row of separatory funnels, all those on the right with water only, and all those on the left with chloroform only. Transfer the chloroform layer of our middle funnel to the funnel on its right which contains only water, and replace the chloroform from the funnel on the left. We now have two funnels in use, with most of our compound over on the right where it went with the chloroform. Shake and do the same thing again for each funnel, transferring the chloroform into the funnel on its right, and replacing with the chloroform from the funnel on its left. We are, in reality, sliding the two solvent layers over each other, allowing the compound to redistribute itself at each step. Hence the name "countercurrent distribution."

Here is how it is useful. In our example, the desired compound was more soluble in the chloroform. We moved the chloroform over to the right each time, so the compound would tend to move along in the chloroform. An impurity, with relatively less solubility in chloroform and greater solubility in water, would tend to "hang back." With a sufficient number of transfers, polypeptides almost identical differing only by a single amino acid, may be separated. Rather than the cumbersome separatory funnels, there is an automatic device, known as the Craig countercurrent apparatus, which may have as many as 1,000 tubes.

Once having a pure substance, the next step was to determine the amino acid sequence. This was first accomplished by Sanger, several years ago, in determining the amino acid sequence in insulin. There have been refinements in the methods, but the principles are the same. Any polypeptide chain has a free amino group at one end and a free carboxyl at the other. Dinitrofluorobenzene or phenylthiocarbamate was made to combine only with the acid having a free amino group. Then, after hydrolysis, the labeled acid was identified. (Sort of playing old maid with amino acids instead of cards!) Other reactions could then be used for the carboxyl end. Next, the peptide was broken into pieces, separated, and the process repeated of finding out what amino acids were present, and which ones were on the ends. Here enzymes were very useful, since proteolytic enzymes do not break polypeptides in the same places. Also, some are specific where they break. Under proper conditions, trypsin will break only those bonds following arginine. Carboxypeptidase will take off only one amino acid at a time, from the free carboxyl end of the chain. So, by finding out what is on the ends, breaking the chains into various pieces, separating the pieces and repeating the process, a puzzle was made in which the parts could be lined up only one way.

The separation and purification of these peptide fragments were as great a challenge as purifying the initial material, since one may find as many as thirty different fragments. Three other techniques, in addition to countercurrent distribution, played the major role. They were paper electrophoresis, column

chromatography, and paper chromatography. Since these are more familiar techniques, I shall pass over them without the emphasis they deserve. I should mention that paper chromatography is really a special case of countercurrent distribution, in which one solvent phase is held stationary in the pores of the paper while the other flows past.

The exciting discoveries came when pharmacologists went one step further and studied the activity of the fragments. In corticotropin (ACTH), for example, it was found that the entire molecule was not necessary for biological activity, but only a part of it. At least eleven of the thirty-nine amino acids could be cut off without loss of activity. There were also indications that among these fragments of corticotropin some may show loss only of certain of the actions of corticotropin and retain others. If these fragments prove to be small enough, it may be possible, synthetically, to "tailor make" some hormones for desired therapeutic actions.

CLINICAL PHARMACOLOGY

Factors Peculiar to the Testing of Drugs on Humans. It might be better to describe this section more as a meeting of minds than a new technique or idea. The proper design of experiments on animals, with adequate control groups, has long been known and followed by pharmacologists. Also, pharmacologists have recognized that if an end point requires subjective judgment by the observer, he must not know whether he is observing a control or an experimental test, *i.e.*, the observation must be blind. In clinical pharmacology, especially when symptoms and subjective responses are being studied, the problem is even more difficult, since there is also the subjective judgment of the patient himself as well as that of the investigator. However, among clinicians, one often finds a different outlook as to what is needed for a proper experiment. The clinician must decide his course of action in the care of a patient upon his judgment of the progress of that patient and his reaction to therapy administered. He cannot proceed according to what happens statistically in 95 out of 100 patients. Accordingly, a clinician tends to evaluate the value of a drug largely upon his impression of the progress of the patient.

Unfortunately, this practice may lead to false experimental conclusions. Evaluation of drugs on human beings is fundamentally the same as on rats, but more difficult. The control group, either untreated or with standard treatment (you cannot let one group die as with rats), is essential. Furthermore, we are dealing with human beings with whom we can communicate, directly and by suggestion. There has been the surprising discovery that positive therapeutic results may sometimes be obtained with totally inactive medicines. Clinical pharmacologists have called this the "placebo effect," and it was surprisingly constant in its occurrence. The effectiveness of the placebo in producing the same reaction as an active drug was 35 ± 2 per cent, in tests ranging from suppression of cough to relief of pain and even hearing loss following administration of streptomycin.

Among the more enlightened clinical investigators there is increasing recognition that clinical experiments must be "double blind," in that neither the patient nor the physician must know the nature of the drug administered. Surprises are often in store when it is found that the drug does not differ significantly from the placebo.

One should not be dismayed, and feel then that some of our therapy is without effect. Studies have been made of the placebo effect itself, and the conclusions are that the placebo effect is real, measurable, and often powerful. Other studies

are in progress to learn more about the mechanism of this action. As members of the pharmaceutical sciences, we must look for the control and proper experimental design lest we attribute to a drug actions which were only those of a placebo.

With so many advances in related sciences, one wonders whence will come the next application to pharmacology. We shall all wait eagerly, and some of us may be so fortunate as to contribute.

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Ignorance, irresponsibility, poverty, and greed are formidable obstacles to the health of the individual.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 294 (1941)

THE SCOPE OF PHARMACEUTICAL MATHEMATICS*

ORVILLE H. MILLER

I have often in the past envied the teacher of pharmaceutical mathematics on the assumption that his course material seldom changed. For instance, in reviewing recent editions of pharmaceutical mathematics texts these show but microscopic changes from the previous editions in comparison to the revisions in other scientific fields. However, I do not believe this should be so today. As our study of pharmacy becomes less empirical and more solidly based on fundamental physical and chemical principles we need a corresponding upgrading and modernization of pharmaceutical mathematics to correspond with this change.

Our discussion here should be concerned with the mathematical needs of the average pharmacy student and not the special needs of our graduate students.

A review of the subjects covered in our present-day math texts shows that with a few additions and deletions these could prove adequate. However, when we consider relative emphasis on subject material much modernization is needed. Devotion of fifteen to twenty pages to outmoded specific gravity determinations, with but a single page devoted to milliequivalents can hardly be considered appropriate to present needs. Other of our more important current mathematical concepts are frequently relegated to appendix status.

Mathematical training of our pharmacy students of today should not be entirely predicated on today's needs, but should anticipate the needs of the future as well since these present students will be practicing pharmacists for many years to come. What is needed in such a program?

First, let's consider possible deletions. These should include the outmoded specific gravity determinations previously mentioned. Alligation should be discarded and this empirical form of witchcraft replaced by straightforward algebraic solutions understandable to any mathematician.

Elementary discussions of the kinds of numbers and simple arithmetic seem hardly necessary in our expanded five and six year program since this should have been taken care of in the prepharmacy and high school requirements.

Next let's consider additions that seem in order. Here we should add the concept of milliosmol to our isotonic calculations. Also, calculations based on the therapeutic and chemical equivalency of different forms of the same drug should be included. Equivalent weights of hydrates and anhydrous forms, acids or bases and their salts, and different salts of the same drug need to be considered. This is particularly true in view of the present and increasing emphasis on labeling drugs and discussion of drug dosage on the basis of the therapeutic ion or component of a salt or complex. This is well illustrated by the labeling on many of our antibiotics and newer drugs. Interest in this type of designation of drug dosage, as you may recall, was markedly stimulated by the problems of interchanging hexamethonium bromide and chloride. An introduction to statistics, such as that now found in Remington, seems highly desirable, not to prepare the student for statistical

* Presented to the Section of Teachers of Pharmacy, AACP, Los Angeles, California, 1958.

analysis but to give him a better basis for understanding present-day pharmacological data.

Finally, let's consider the change in emphasis that is needed. Our present instruction in systems of weights and measures and their interconversions, ratio and proportion, percentage solutions, specific gravity, reducing and enlarging formulas, thermometry, proof strength, and commercial problems of discounts and mark up, are adequately or more than adequately covered. However, I do have a quarrel with the usual problems involving pricing. These leave a wrong implication that retail prices should be based on a consideration of all possible discounts in arriving at the cost to be used in the pricing system. Cost, as far as pricing is concerned, should be based on usual wholesale cost, and such problems should be formulated on this basis.

The major shift in emphasis is needed in our basic mathematical tools. Assuming adequate prepharmacy training in arithmetic, we should be able to spend more time in the algebraic and logarithmic calculations involved in problems dealing with pH, buffers, dissociation constants, absorbence measurements, etc. This is an absolute necessity if our courses in physical pharmacy (actually pharmacy properly upgraded) are to be of proper substance. Discussions and predictions of incompatibility usually allotted to prescription practice courses should be based largely on a consideration of dissociation constants, calculations of free acid or base content of solutions, and solubility as a function of pH. Acceptable pH limits of various pharmaceutical solutions should be judged on the basis of calculations of total acidity or buffer capacity rather than on arbitrarily set limits. Drug absorption and effect can be judged in part on these same considerations. Thus we find an extension of our mathematical needs of physical pharmacy into prescription practice and pharmacology.

Prescriptions and labeling of pharmaceuticals in terms of milliequivalents, molarity, and normality are steadily increasing in usage. Therefore, compounding and dispensing problems involving these units should receive much more attention. Other problems associated with compounding and dispensing also need further emphasis than that indicated in our pharmaceutical texts. Calculations involving dispensing tablets, stock solutions, tablet triturates, aliquot portions, and other compounding problems receive scant attention.

Problems of the industrial pharmacists and bulk compounder involving conversions and equivalency of our larger units of weights and measures are also usually neglected. Considerations of percentage error and significant figures also are deserving of more attention throughout all phases of our calculations.

In summary, our approach to pharmaceutical mathematics is in need of some alteration when judged by current pharmacy texts. The author's recommendations are as follows:

1. Delete alligation, outmoded specific gravity determinations, and discussions of elementary arithmetic.
2. Add concepts of milliosmol, therapeutic equivalency, and elementary statistics.
3. Give greater emphasis to algebraic and logarithmic calculations, milliequivalents and molarity as expressions of concentration, special dispensing and industrial problems, percentage error and significant figures.

PHARMACY CALCULATIONS SHOULD BE INTEGRATED WITH OTHER PHARMACY COURSES*

STANLEY V. SUSINA

The report of the Committee on Curriculum of the American Association of Colleges of Pharmacy (1) states "The course in pharmaceutical calculations consists of a study of the application of the system of weights and measures and the mathematical calculations involved in pharmaceutical procedures and practice." It further states "The objective of the course is to develop ability to solve the mathematical problems encountered in the preparation of pharmaceuticals and the compounding of prescriptions."

Keeping these two points in mind, let us consider how a course in pharmaceutical calculations can be presented by integrating it with other courses of pharmacy, and whether the objective of the course as defined above can be so attained. In this consideration, let us keep in mind the persons involved in such a presentation, the students and the instructors, and see how integrating the course in pharmaceutical calculations will affect the course content as well as the persons involved.

From the viewpoint of many students, mathematics of any kind, and this includes pharmaceutical calculations, is an abstract subject. Unless the instructor has sufficient time to develop properly the material which is generally included in such a course, it becomes simply a course designed to teach certain factual material. As such, the student memorizes in the time allotted (usually only a quarter or semester) the information which is crowded into this short, concentrated, and congested time interval. Material which is thus memorized is obviously not understood by the student and, as a result, is retained for only a relatively short period of time. The effectiveness of material presented in such a manner is of little or no value to the student.

In an article dealing with proficiency in pharmaceutical calculations, Kearns (2) points out that not only must the student have a chance to use the acquired arithmetical concepts which he has been taught in his secondary school mathematics, but that he must have an opportunity to practice the arithmetical skills he has acquired. If the student is to become proficient in pharmaceutical calculations, he must have an opportunity for extensive and constant use of these skills. I believe the best way to provide for this is to integrate in the curriculum continuous opportunities for the student to make use of them.

Before answering the question of how this can be accomplished, it will be necessary to list some of the items which the student is expected to know and which are generally covered in courses of pharmacy calculations. For purposes of discussion, I have abstracted from one of the commonly used pharmacy calculations textbooks (3) the following topics which I have chosen to arrange into two groups. In Group One, I have listed those which are now incorporated into or could be incorporated into basic science courses, such as mathematics, physics, and chemistry. Group Two includes

* Presented to the Section of Teachers of Pharmacy, AACP, Los Angeles, California, 1958.

those topics which I believe would be best integrated into pharmacy courses taught throughout the professional curriculum.

I. Group One
   A. Significant figures
   B. Ratio and proportions
   C. Density, specific gravity, specific volume
   D. Chemical problems
      1. percentage composition
      2. chemical reactions
      3. milliequivalents
      4. pH and H ion concentration
   E. Exponential and logarithmic notation

II. Group Two
   A. Metric and apothecary systems of weights and measures
   B. Relationship between metric and apothecary systems
   C. Reduction and enlarging formulas
   D. Dilution and concentration
      1. stock solutions
      2. dilution of acids and alcohols
      3. triturations
      4. alligation
      5. aliquot method of measuring
   E. Percentage problems
      1. weight/volume
      2. volume/volume
      3. weight/weight
   F. Isotonicity problems

In reviewing the curriculum at our college, we noted a considerable duplication of topics which were being presented in several courses. In a curriculum which is admittedly overburdened, this represents a waste of time. An examination of the topics listed in Group One reveals the fact that all of them are adequately presented and covered in several courses in pharmacy curriculum. For example, the subject of significant figures is incorporated into courses of mathematics, physics, and chemistry. It obviously does not need to be presented as a separate topic in a course of pharmaceutical calculations. In a basic physics course, the concepts of density and specific gravity are adequately covered. The inclusion of a laboratory assignment in a pharmacy course which serves to illustrate and emphasize the principles of specific gravity and density is more significant and logical than the presentation of these topics in a separate course of pharmaceutical calculations. The concepts of exponentials and logarithmic notations are sufficiently covered in a basic mathematic course, but in addition, the application of them is made in the disciplines of physics, quantitative analysis, and drug assay. This represents still another example of the integration of these points in a more logical fashion than teaching it as a separate unit in a special course of pharmaceutical calculations.

Similarly, chemical problems dealing with pH, milliequivalents, chemical reactions, and percentage composition are better presented in the courses of chemistry where the principles involved can be correlated with laboratory

experiments designed to show the student the application of the mathematical concepts involved.

The second group of topics are of particular importance since they represent these mathematical concepts which are necessary for the solving of problems encountered in the preparation of pharmaceuticals and the compounding of prescriptions. These lend themselves well to successful integration in pharmacy courses, and it is with these I would like to deal in more detail.

A point which was emphasized at the Teachers' Seminar on Pharmaceutical Education (4) was that one of the principal problems of teaching is to so organize and teach the content of pharmacy and its related sciences that it will be learned through comprehending its meaning rather than through mere memorization. One of the functions of a teacher is to tie this information together so that it can be readily understood and learned. If didactic material which is presented can be spread over an extended period of time and concomitantly the student can be shown the value and the application of this material in a laboratory course designed to apply the principles presented, he will become interested in the subject. The principles being taught are no longer of an abstract nature to him, but have definite meaning and significance. Having gained the interest of the student in this manner, a tremendous advantage has been gained by the instructor. The student, now willing to learn, applies himself to the process of learning material which in the past may have seemed to be merely rote memorization.

The beginning course in pharmacy is an excellent place to introduce to the student the systems of weights and measures of the metric and apothecary systems. This material can be easily integrated with the laboratory experiments which serve to illustrate the utilization and the relationships which exist between the two systems and conversions between them. Instead of merely memorizing the various equivalents of the two systems, the student has the opportunity of actually using the various weights and measures of both systems. The problem of rote memorization has been replaced by a logical sequence which permits the student to see the purpose and uses of the various weights and measures he will be expected to use in his future pharmaceutical practice.

When the student is taught the proper use of the prescription balance he can learn also how to calculate percentage error and the determination of potential error. Since the measurements he makes are never absolutely accurate, it is important for the beginning student to recognize the limitations of his measuring instruments and to know the magnitude of the errors that may be incurred when he uses them. In a simple experiment in which he is required to weigh out a small quantity of material, he can be taught the concepts of percentage of error.

Another method of measuring which can be used to integrate a very useful method of calculation is that of aliquots. When the degree of precision in measurement required is beyond the capacity of the instrument at hand, the student can be shown that he may achieve the desired precision by measuring and calculating in terms of aliquot parts. An example of a laboratory preparation which can be used to illustrate this point is Iron, Quinine and Strychnine Elixir. Not only does the student have an opportunity of reducing formulas with this type of experiment, but he can

determine for himself that his balance is not capable of measuring the small quantity of strychnine which is required. He thus has an opportunity of applying the principles of aliquots in the laboratory and will better remember the lesson under these conditions than if the same topic has been presented to him in a separate course of pharmacy calculations. In a similar manner, the preparation of a laboratory quantity of N.F. Antiseptic or Alkaline Aromatic Solution can be used to illustrate the method of measuring small volumes of liquids by the aliquot method. This correlation with actual laboratory instruction serves to better impress upon the student the importance and the utilization of these mathematical concepts.

The course in pharmacy preparations also serves as an excellent means of integrating problems of concentration and dilution. Many official preparations can serve as examples to illustrate such concepts as alligation: for example, the preparation of a diluted acetic acid from acetic acid in preparing Iron and Ammonium Acetate Solution or the dilution of alcohol in the preparation of an alcoholic menstruum used in a galenical extraction. In such a course he can apply and see for himself also the differences between percentages solution calculations. The simple experiment of preparing a potassium iodide solution can illustrate quite vividly the difference between a solution prepared by a weight/weight or by a weight/volume calculation and serves better than a series of problems of the nature provided by a pharmacy calculation course.

Often, difficulty is encountered in a pharmaceutical calculations course if there is attempted the teaching of certain types of problems in advance of the teaching of the techniques involved. Sprowls (5) points out the difficulty encountered by students when they are presented calculations dealing with dispensing problems before they have had a course in dispensing. A further problem occurs when problems using terminology unfamiliar to the student are presented in a pharmacy calculations course.

Unless the student has a proper understanding of the terminology involved, he may have difficulty in understanding many of the problems presented, not because of the mathematics involved, but because he does not understand the problem as it is stated.

The inclusion of isotonic calculations in a course of pharmaceutical mathematics before the student has had the basic courses of physics, physical chemistry, physical pharmacy, and physiology places the student at a disadvantage which he need not suffer. If the same calculation is presented to him after he has had a proper understanding of the principles of osmotic pressure, it can be simply integrated into the course of dispensing pharmacy.

The preceding examples illustrate some of the methods which can be used to integrate principles which are often presented as separate topics in a course of pharmacy calculations into basic science and pharmacy courses. It is hoped they have served to demonstrate the advantages to be gained by this type of presentation.

In conclusion, the advantages which result from this type of integration are:

First, the integration of pharmaceutical calculations in other pharmacy courses provides the student with a definite application of the mathematical concepts presented. This creates a more lasting impression, and, as a result, the student is better motivated to learn the subject matter which is presented.

Second, the inclusion of pharmacy calculations with other pharmacy courses allows the instructor more time to develop the subject fully and properly. It eliminates the necessity of presenting material before the student has had the proper background for the understanding and utilization of the calculations.

Third, the spreading of pharmaceutical calculations over an extended period of time permits the student an opportunity for better comprehension and eliminates the cramming which occurs in a short course.

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. . . the chemist and the physicist have an easier task than the physician. In their dealings with atoms and energy they are the least hampered by the human equations of ignorance, superstitions, and misunderstandings of his fellow man.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 297 (1941)

PHARMACY CALCULATIONS SHOULD BE TAUGHT AS A SEPARATE COURSE*

WINTHROP E. LANGE

Before I begin a discussion of the merits of a separate course in pharmacy calculations, it will be necessary to consider briefly what I believe is the purpose of such a course.

It is my feeling that a course in pharmacy calculations, appearing in the first or second year of a pharmacy curriculum, is expected to review the fundamental processes of arithmetic. These processes (such as multiplication, division, use of fractions, etc.) are then applied to pharmaceutical systems. The course's primary aim is accuracy based upon an understanding of terms and units. Sufficient practice or experience with these terms and units may then be utilized in developing practical applications, or in other fields of knowledge in the pharmacy curriculum.

Now let us consider the various parts of the purpose of pharmaceutical calculations. In this way it will be possible to show the need for a separate course in the pharmacy curriculum.

In nearly all discussions of pharmacy calculations the subject of arithmetic arises. To suggest that a course should be taught in college which deals with the simple skills of arithmetic is usually met with a great deal of opposition. Yet, we agree that it is the basis for many of the calculations we use in pharmacy. Although our students have had algebra, trigonometry, or even calculus in college, they still have trouble with simple arithmetic. This can be traced, in many cases, to the absence in any of the above courses of much arithmetic. The last contact most of our students have had with arithmetic was in the eighth grade. They may have a good background in mathematics, but have lost their proficiency with simple arithmetic. If we consider the consequences of a mistake in arithmetic in filling a prescription, it is possible to see the necessity for the students to master this skill. Where are we going to review this material? The logical place is in a course in pharmacy calculations. It would be a difficult thing to integrate what I consider a satisfactory review of simple arithmetic in any course in pharmacy.

The value of a firm foundation in arithmetic cannot be overemphasized. The majority of failures of students in schools of pharmacy has been shown to be due to a lack of proficiency in mathematics. Why then can we not consider a review of simple arithmetic for pharmacy students as essential as a review of English which we have in our curricula?

After sufficient time has been allotted for a review of arithmetic, it then can be integrated into a study of pharmaceutical weights and measures. If we dealt only with the metric system this would be a simple process. However, we don't, and time must be taken for practice with conversions. Simple arithmetic is also involved in problems of dilution, percentage solutions, etc. As these problems relate to drugs, which are becoming more and more potent, it is essential to establish habits that will insure the correct answer every time. This can only be done with practice. In a separate

*Presented to the Section of Teachers of Pharmacy, AACP, Los Angeles, California, 1958.

course it would be much easier to determine what is sufficient practice. It has also been said many times that repetition is the only real teacher. By this I do not mean that the students should work the same problems over and over, but rather that sufficient time could be allowed to present a large number and variety of problems. Only in this way are we able to determine if the students understand what they are doing. After all, we are trying to establish habits for the future rather than a temporary ability to handle pharmacy calculations.

One of the major arguments against a course of this type in pharmacy calculations is that it fails to interest the students. At this stage of their education in pharmacy it is difficult for them to see the practical application of these arithmetic skills. It is possible and highly desirable to insert simple laboratory experiments or demonstrations. They may be used to illustrate conversions, dilutions, etc., and tend to increase the interest in the material.

It has been said that proficiency in pharmacy calculations is proportional to experience with them. It would seem to me to be a very difficult thing to check proficiency in an integrated course unless some of the examinations consisted only of calculations It has been my experience, when only one or two problems are inserted in an examination, to find it possible for a student never to be able to work the problems correctly and still pass the course. Even when a student does obtain the correct answer to a problem it is difficult to determine whether he understands what he is doing. Unless problems of a like nature are presented in various ways it is practically impossible to determine proficiency.

This then leads to the problem of whether one or more ways of working a problem should be allowed. I believe that it is an involved process to rearrange the arithmetic habits or procedures once they have been established. The method which a student finds easy for him to work a particular problem can be traced to his first contact with arithmetic. In most cases this took place during his elementary education. Thus it is unfair to expect students from various backgrounds to work all problems in one way. In a separate course dealing only with pharmacy calculations it is possible to present various ways of working problems. The student may then select the one which is easiest for him. This of course is time-consuming and would be hard to plan for in an integrated course.

Up to this point the discussion has centered around the need for time to accomplish what is thought necessary really to teach pharmacy calculations. There is also the problem of being sure a student receives instruction in all the components of a course in pharmacy calculations. It is easy to check course content in a separate course. However, in an integrated program it is not as easy to determine if and when a particular topic, such as percentage solutions, has been discussed. Where different instructors may be in charge of the theoretical and practical pharmacy courses this can easily become a problem. In a separate course it is also easier to consider certain arithmetic procedures which are difficult to develop elsewhere in theoretical courses (such as alligation, alcoholometric calculations, etc.).

Despite the presence in many pharmacy curricula of a course in pharmacy calculations, we still have trouble with students not being able to pass the state board examination in pharmacy calculations. This in part might be due to a lack of proficiency by the students, or an inability to recognize a

particular type problem. In fact, it might be an interesting study to try and pinpoint the cause of failures in pharmacy arithmetic. However, until we have an answer to this problem we can only try to improve our methods of teaching pharmacy calculations. The use of a separate course in pharmacy calculations during the last year of a pharmacy curriculum is being employed by some schools. Whether such a course deserves credit or not is not important. The main thing is that in schools where such a course is offered, the students are better prepared for state board examinations. It does not guarantee they will pass the examination, but it does serve as a final reminder to the student of the importance of pharmacy calculations in the profession of pharmacy.

Although this type of review course is not the particular course in pharmacy calculations which we are primarily interested in, it does serve to demonstrate the fact that repetition does no harm. All of the calculations of pharmacy cannot be covered in one course. The problems of dispensing (isotonic solutions, buffers, etc.) certainly do not lend themselves to a basic course. Thus the results of a review of all pharmacy calculations could substantiate the advantages I have presented for a separate course in basic pharmacy calculations.

In conclusion I would like to list the points I have made which show the need for a separate course in pharmacy calculations. They are, that the separate course provides:

1. The logical place for a review of simple arithmetic.
2. Sufficient time to practice with a large number and variety of problems.
3. Greater ease in checking proficiency.
4. Time to present various ways of working problems.
5. A better opportunity to check whether all important types of pharmacy calculations have been presented.
6. An easier way to cover arithmetic procedures which do not blend readily with theoretical pharmacy.

. . . real research . . . takes everything that the ablest of us can deliver. It is not a union schedule of forty hours a week, but a sweating proposition of eighteen hours a day.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 298 (1941)

A STATE BOARD MEMBER'S VIEW OF PHARMACY CALCULATIONS*

WILBUR E. POWERS

Before beginning my paper I wish to emphasize that I have never served as a member of a board of pharmacy. I was, however, associated on a full-time basis with the Board of Pharmacy of the State of New Jersey for fifteen years, the last ten of which I was Secretary. During that period of time, as part of my work, I aided my board members in the preparation and grading of examinations, including the examination in pharmaceutical and chemical problems. For a period of years it was the policy of the New Jersey Board to assign this subject to each newly appointed member as the one examination with which a practicing pharmacist becoming an examiner for the first time would be initially better qualified to conduct. As a result I can relate to you a composite of the views of a number of members on this subject, and I am particularly indebted to Mr. Michael Vitale, who is now serving both as a member and Secretary of the New Jersey Board as well as the examiner in this particular subject. He has supplied me with all of the material in this paper concerning specific problems.

This is possibly the one so-called theoretical examination which is the greatest source of irritation to a board member. He feels this is actually a practical examination as almost any problem used could be one which might present itself in the everyday practice of pharmacy. It is true, of course, that some types of calculations would be rarely encountered in the prescription department. However, board members are generally of the opinion that a candidate should not be granted a certificate of registration unless he is determined by the board to be fully qualified to practice pharmacy. In other words, he must be a safe pharmacist, and he is not safe if he cannot correctly make all reasonable calculations.

This same reasoning applies in the preparation of a practical pharmacy examination. Should tablet triturates, powders, suppositories, and other rarely encountered prescriptions be included? They are a part of many examinations because the point arises as to whether an individual can be properly termed a pharmacist and registered in the state as such by the board, in its role as a protector of the public health, if he cannot prepare all of these various pharmaceutical preparations.

We all know that under the stress of an examination—particularly one given by a board—candidates frequently make errors in simple problems. It is almost unbelievable to see some of the extremely poor papers turned in at each examination. When a board member grades one of these papers, where the candidate cannot correctly work problems which ordinarily could be done in your head, he wonders whether such a person should ever be granted registration. Of course, there are usually extenuating circumstances. Some candidates go all to pieces the first time they appear for a board examination but do much better when they are forced to repeat the examination. These, however, are the exceptions you all know about.

The usual calculations encountered in the filling of ordinary prescriptions

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and those generally involving only weights, measurements, and temperatures are done easily by the vast majority of the applicants. These include changing from one system of weights to another, the transferring of temperatures from one system to another, the calculation of children's dosages by Young's Rule, and other simple arithmetical problems.

However, it is a different story when you come to chemical calculations. For some reason too many candidates miss even simple problems such as determination of the percentage of water of crystallization and other ingredients, yields in double decomposition equations, molecular weights, interpretations of assay procedures, etc. In fact the New Jersey Board has eliminated most chemical problems, feeling that they are so seldom encountered in practice, applicants need not be examined in this type of calculation.

A real bugaboo is specific gravity. It can be argued this type of calculation is also seldom encountered, but I think most of us will agree a pharmacist should have a working knowledge. A candidate certainly encounters it often enough throughout his course of study. In a fairly recent New Jersey examination a problem was given requesting the applicant to determine the volume in fluid ounces of one pound of methyl salicylate with the specific gravity given. Nearly one third missed the problem. Some did not even arrive at an answer although there was a great deal of figuring on their papers. A common error was the use of incorrect equivalents, the most common being 480 gr. as the weight of an ounce of water. Another candidate reversed an equivalent and stated that a pound equals 2.2 kilograms.

A few jotted down the correct formula for determining specific gravity, divided sixteen by the specific gravity given, and then labeled the result the answer. Others worked it out in cc. and overlooked the fact the problem requested a determination in fluid ounces. There were, of course, the usual arithmetical errors and those in transposing results from one calculation to another. However, the board felt that this was a fair problem which was not too difficult, had a practical value, and should have been solvable by the majority of candidates.

Another specific gravity problem perhaps was too complex as nearly half missed it. A prescription was given for rose water ointment containing five ingredients with weights totaling 100 gm. The candidates were requested to determine the number of cc. of mineral oil required for five pounds of ointment, the specific gravity being given. This involved a great deal of calculation which, along with the usual specific gravity trouble, was just too much for many candidates.

Another problem missed by about a third of the candidates was one requesting the determination of the number of grams of petrolatum to be mixed with 250 gm. of 10 per cent and 750 gm. of 20 per cent tannic acid ointments to prepare a 5 per cent ointment. Although many graduates are hazy on the use of alligation, this is a problem which can almost be done in a person's head and actually is very simple. Most of those obtaining an incorrect answer, however, attempted to use the alligation method.

Another troublesome problem was one calling for the number of minims of a 1:50 stock solution of atropine sulfate to be used in compounding a prescription calling for 1½ gr. of atropine sulfate in a 2 fluid ounce aqueous solution. A majority of the candidates stated the stock solution would

contain 1 grain in 50 minims and, since 1½ grains were required, 75 minims of stock solution should be used. The actual answer is almost 80 minims. While this is not a substantial error, most of the candidates evidently did not have a clear understanding of stock solutions, and the Board felt that this problem should be worked out exactly. Incidentally, the Board relies on the USP in its interpretation of problems involving percentage solutions.

I can remember one problem the Board used at one time which was apparently too remote in its application as most candidates simply could not reason it through. It involved raising the melting point of cocoa butter through the addition of white wax. The melting point of cocoa butter was given as was the amount of white wax which would raise the melting point a certain amount. The candidate was then asked to determine the quantity of white wax required to increase the melting point of the cocoa butter to a specified temperature. While the problem did have a practical application, it would be seldom, if ever, applied. Since most pharmacists simply add a certain percentage of white wax during the summer months, as such critical control of the melting point is not often indicated, this possibly would not be considered a valid problem.

I could go on mentioning types of problems, but all of you are quite familiar with the results. What I am attempting to point out is that board members have discovered that too many candidates are not too qualified to work problems such as those involving specific gravity, alligation, the preparation of isotonic eye solutions and even percentage solutions, which they may have learned fairly well when taking the course but have since forgotten. The question to determine then is just how important this knowledge is, and the argument that after registration the candidate can look it up, if necessary, is not too convincing to many board members.

It is reasonable to assume that candidates review these calculations before taking the board examination, especially when it is known the examiner gives problems of this type. The fact, however, that the problems are often solved incorrectly on the examination would indicate the candidate may not have actually had a real working knowledge of these problems and apparently cannot effectively review them.

Many board members are quite outspoken in their opinion that college graduates should be able to work any of these problems, and there is a tendency to place the blame on the college staff rather than to look back further into the precollege studies. After all, they reason, a pharmacy arithmetic book is not too lengthy nor too involved. No knowledge of higher mathematics is actually required, and it should be possible for a candidate to review this work by himself before taking the board examination. I have many times heard the suggestion a student should not be graduated until he passes a satisfactory examination in pharmaceutical arithmetic near the end of his senior year. I do not feel I am qualified to discuss this subject, and I am certain it has been thought about and perhaps may even be done in some pharmacy schools. It would appear there is something radically wrong when so many candidates do so poorly in this very important examination, and this should be discussed, as it is today, until some effective procedure is adopted.

In closing, I wish to emphasize again that my impressions are those gained while Secretary of the New Jersey Board of Pharmacy. I do not

know first hand how great a problem exists elsewhere, but I would assume it does or there would be no reason for this panel. I also want to point out that the candidates taking the New Jersey examinations come from all seven of the schools and colleges of pharmacy in the immediate area in addition to those in other sections of the country. The problem existing, therefore, in New Jersey is a general one which has not been solved to date. I am certain the New Jersey Board and especially Mr. Vitale, the present examiner in this subject, are very interested in the views of others on this subject, and will welcome any suggestions, particularly those which would come from a section such as yours.

. . . if a teacher fails to take full advantage of the opportunity to prepare his student to assume a proper place in a complex society and give him some conception of his responsibility to society so that he may more nearly exemplify the principles of good citizenship, that teacher, regardless of his field, fails in measuring up to the standards by which a teacher is eventually judged.

Robert C. Wilson, Am. J. Pharm. Ed., 4, 41 (1940)

GRADUATE TRAINING IN SYNTHETIC ORGANIC CHEMISTRY: CONSENSUS OF UNIVERSITY OF MINNESOTA COLLEGE OF PHARMACY FACULTY*

GEORGE P. HAGER

Any discussion of the pharmaceutical chemist's need for training in the principles and practices of synthetic organic pharmaceutical chemistry should be prefaced by a consideration of the pharmaceutical chemist's need for training in chemistry in general. "Synthetic organic pharmaceutical chemistry" should not be regarded as an esoteric segment of the pharmaceutical chemist's science. His knowledge of chemistry in general consists in large measure of the principles, processes, and techniques which from one point of view alone could be designated synthetic organic pharmaceutical chemistry. His research objectives emphasize the great importance of chemistry in his training. His research productivity testifies to his profitable use of chemistry in his practices. As chemistry is indispensable to the pharmaceutical chemist, so also is synthetic organic pharmaceutical chemistry.

Chemistry is "the science that treats of the composition of substances, and of the transformations which they undergo." The *synthesis* of one compound obviously is the *reaction* of one or more different compounds. The reactions actually used for the purpose of synthesis are in the broader sense especially homogeneous transformations which, from the standpoint of the yield of a particular product, possess favorable thermodynamic characteristics. The latter, in turn, are in large measure a function of the composition of the starting substances, intermediate species, and products under the conditions of the reaction. This integration of composition, thermodynamics, and reaction kinetics does not permit any real separation of synthetic organic pharmaceutical chemistry as a discipline apart from chemistry in general.

Both synthesis and analysis generally involve the same phenomena. The structure of a naturally occurring medicinal agent often may be deduced most readily from a knowledge of the initial substrates and the reactions they undergo during the phytochemical synthetic processes. Biogenesis of natural products consists of a series of synthetic organic pharmaceutical reactions occurring under the influence of enzymes. The same thing applies to biological transformations of medicinal agents in living organisms. The interactions involving drugs at receptor sites of biological systems, detoxication, and other metabolic conversions of great importance in research on medicinal agents can generally be construed equally well as the *reactions* of the compound which is administered or the *synthesis* of the compound which is excreted. If it be conceded that analysis, proof of structure, biogenesis, and metabolism of medicinal agents are chemical transformations cogent to the research interests of the pharmaceutical chemist; and if it be conceded that these transformations are the same whether the objective be one of synthesis, one of analysis, or one of understanding the mechanism of a drug's actions; then there is little room to doubt that knowledge of synthetic organic pharmaceutical chemistry is constantly used, directly or indirectly, in pharmaceutical chemical research and should be stressed in the graduate pharmaceutical chemistry curriculum.

*Presented to the Section of Teachers of Graduate Instruction, AACP, Los Angeles, California, 1958.

Knowledge of synthetic organic pharmaceutical chemistry is needed by pharmaceutical chemists even when their efforts are not directed towards the synthesis of organic pharmaceutical chemicals. The same knowledge is needed in even higher degree by pharmaceutical chemists who do engage in the synthesis of organic pharmaceutical chemicals. Unfortunately there are pharmaceutical educators who deny that pharmaceutical chemists should concern themselves with research involving the synthesis of new compounds for biological testing. Moreover, there are pure chemists who most willingly agree with them. The attitudes of each of these merely reflect the regrettable disaffection that appears to exist sometimes between chemists and pharmacists in general. Both groups fail to realize that the true schism between pharmacy and chemistry is genealogical rather than philosophical. The genealogical relationship between these two great professions can readily be established historically. For example, it is of historical significance that *Liebig's Annalen der Chemie* was originally established in 1832 under the title, *Liebig's Annalen der Pharmacie*. When the chemistry pseudopod developed and achieved a degree of autonomy, the respected periodical became known as *Liebig's Annalen der Chemie und Pharmacie*. The completed fission was manifest in 1874 when the current title, *Liebig's Annalen der Chemie,* was adopted.

With their common origins, it is understandable that pharmacy and chemistry still have certain common interests. The many points of cross-over between the two professions have given rise to a number of semantic difficulties. For example, the Ph.C. (Pharmaceutical Chemist) degree formerly granted by colleges of pharmacy in this country is a vestigial reminder of the common origins of the two professions. The Ph.C. degree is still granted by the Pharmaceutical Society of Great Britain. It is the professional degree bestowed in recognition of the qualifications of its recipients to practice pharmacy. The B.Pharm (Bachelor of Pharmacy) degree, on the other hand, is not the professional degree. It is granted by British universities to candidates who qualify to undertake pharmaceutical research including pharmaceutical chemical research. The situation is almost reversed in the colleges of pharmacy in this country. The bachelor's degree in pharmacy is generally accepted as the qualification for the professional practice of pharmacy. Graduate degrees, M.S. or Ph.D., are awarded in pharmaceutical chemistry.

Many of our industrial colleagues confuse pharmaceutical chemistry with pharmacy, pharmaceutics, or pharmaceutical technology. It has not been uncommon for graduates with doctorates in pharmaceutical chemistry to be confronted with problems of new product research and development when they join the research and development division of a pharmaceutical manufacturer. Fortunately they did learn something about compatability, miscibility, and shelvability in their undergraduate training; and their graduate training in pharmaceutical chemistry had an indirect broadening effect on their capacity to deal with such problems. In such cases, however, a justifiable distinction is not made.

An unjustifiable distinction often is made, on the other hand, between pharmaceutical chemists and medicinal chemists. The syllabi of certain pharmaceutical chemistry courses, including their synthetic aspects, are indistinguishable from the contents of medicinal chemistry textbooks. Entitling textbooks "medicinal chemistry" in contradistinction to "pharmaceutical chemistry" is misleading. Calling them textbooks (or journals) of medicinal and pharmaceutical chemistry is redundant.

Is synthetic organic pharmaceutical chemistry instruction an important part

of the training of M.S. and Ph.D. candidates in pharmaceutical chemistry? At this point another pertinent question must be asked. Should medicinal chemists be trained in synthetic organic chemistry? An element of snobbery seems to be discernible in the attitudes of those pharmaceutical educators who make a fetish of all things pharmaceutical when they answer these questions: "No, pharmaceutical chemists should not be trained in synthetic organic chemistry. Yes, medicinal chemists should be trained in these disciplines." It is completely unjust to accuse nonpharmaceutical individuals who give these same answers of a certain degree of bigotry? Both groups are sometimes very militant in drawing this arbitrary line between pharmaceutical chemists and medicinal chemists; common traditions, common disciplines, common research objectives to the contrary notwithstanding. The pharmaceutical educator who refuses to add to his pharmaceutical chemistry staff a competent chemist, trained also in biological science, but who happens not to hold a baccalaureate in pharmacy, is shortsighted. He who criticizes pharmaceutical chemistry teachers for emphasizing chemistry in their courses is incongruous. The administrator who urges that all students interested in the chemical aspects of drugs be transferred to other departments of the university must be frustrated to some degree by his own sense of inadequacy. The fences built by this minority group restrain more than they retain for the good of the profession.

Some of the difficulties could be resolved if everyone gave proper emphasis to the fact that chemistry is a basic science whereas pharmaceutical or medicinal chemistry is interdisciplinary. The interdisciplinary nature of pharmaceutical chemistry accounts somewhat for the apparent conflict of interests. A drug is a unique species of matter not because of its composition or the synthesis that produced it, but by virtue of its behavior in a biological system. Much of the work of the pharmaceutical or medicinal chemist has a fundamental basis in the interrelationships between molecular structure and biological activity. Pharmaceutical chemistry knowledge has both a biological and a chemical component. Pharmaceutical snobbery would purge the discipline of its basic chemistry component, and nonpharmaceutical bigotry would minimize the biological component. In either case the discipline would be emasculated. On the one hand, biological activity uncorrelated with structure and associated only with a name or number would result. On the other hand all of the subtleties and profundities of molecular structure would be expounded, and the biological considerations would be as naive as they are superficial.

The pharmaceutical chemist is not an organic chemist, nor yet is he a pharmacologist. He is a hybrid trained in the disciplines of the organic chemist which enable him to synthesize or analyze substances for biological testing and eventual therapeutic use, and in the disciplines of the pharmacologist that enable him to decide what substances should be synthesized and analyzed for these purposes. His decisions are guided by proper emphasis of both chemical and biological considerations. By virtue of his training in chemistry, particularly his training in synthetic organic pharmaceutical chemistry, he does not naively create impossible problems for his pure chemist colleagues. By virtue of his training in biology, he does not harass the pharmacologist, microbiologist, etc. with a flood of compounds that practically duplicate the prototype of the investigation. The biologically-untutored chemist frequently produces, because of the expediency of a synthesis, an extensive series of compounds that prove after much costly testing to be as homogeneous in their biological activity as they are in their structural character-

istics. The fact that one member of a series of structurally similar compounds sometimes exhibits an anomalous biological activity is a convincing demonstration of the great specificity of certain biological responses, but it is only a specious justification for testing in every case the countless homologs, isomers, and isoters the chemist can conveniently produce. If we stress too much the significance of these anomalous findings, we shall ever be in the position of producing 606 compounds in order to find one that works.

The interdisciplinary nature of pharmaceutical chemistry is its distinguishing characteristic. The communion of chemical and pharmacological attributes determines its research productivity. Other combinations of chemistry with various pure disciplines have also been most fruitful. Biological and physiological chemistry are autonomous borderline sciences, unique unions of chemistry and physiology. Recently a combination of chemistry and anthropology has been recommended [Roger J. Williams, *American Scientist*, 46, 1-23 (1958)]. Chemical anthropology or anthropological chemistry, surname it as you wish, is expected to be scientifically prolific because it is interdisciplinary. Comments on this point apply equally well to pharmaceutical chemistry and the other chemistry hybrids.

> Historically many scientific as well as technological advances have resulted from the wedding of two different disciplines. It has often been observed that at the present time the most productive areas are those which lie on the borderline between two disciplines. In keeping with this idea, I propose a wedding between the two disciplines chemistry and anthropology. I suggest that as a result of this union, tremendously important insights will immediately emerge.

If, like pharmaceutical chemistry, chemical anthropology becomes an established, popular, and prolific field, the basic scientists, the chemists and the anthropologists, may reasonably be expected to engage in the practice of chemical anthropology. At such a time, it is most unlikely that the chemical anthropologists and their academic departments will surrender the field and discontinue their efforts. By the same token, it is unreasonable to expect pharmaceutical chemists to turn their backs on their traditions, to succumb to internal or external forces that would jeopardize their academic program, and to give up a challenging field at a time when their efforts are bearing fruit in the form of rewarding structure-activity correlations, new insights into the mechanisms of biological responses to applied compounds, and the discovery of new medicinal agents of the wonderful or miraculous category.

Pharmaceutical chemistry is interdisciplinary, and *chemistry* is certainly one of the most important of the disciplines of the pharmaceutical chemist. Synthetic organic pharmaceutical chemistry is not a unit of principles, processes, and techniques separate from organic chemistry or chemistry in general. Pharmaceutical chemistry teachers must not delete from the syllabi of their courses transformations which happen to be useful for purposes of synthesis. Without organic synthesis, the chemistry component of pharmaceutical chemistry will practically vanish. Without the chemistry component, pharmaceutical chemistry will cease to exist. Students of pharmaceutical chemistry should have a strong organic chemistry minor. Teachers of pharmaceutical chemistry should endeavor to integrate and elaborate their knowledge of organic synthesis in the syllabi of pharmaceutical chemistry courses, not only as it applies to the synthesis of medicinal agents but also as it relates to biogenesis of natural products, structure-activity relationships, and metabolic transformations of drugs in biological systems.

If those phases of pharmaceutical chemistry that deal with the synthesis of

drugs in accordance with natural patterns or structure-activity relationships are now or later become generally identified as medicinal chemistry, departments of pharmaceutical chemistry should rename certain of their courses as medicinal chemistry; and colleges of pharmacy should set up and support departments of medicinal chemistry.

Call the field or any part of it what you will, the chemist who conducts research on pharmaceuticals is best trained in a college of pharmacy. Here alone he encounters the atmosphere of physical science (not found in schools of medicine) and biological science (not found in departments of chemistry) in which his borderline science can thrive. Here alone will he find the ancillary fields of pharmaceutical technology, pharmaceutical economics, and pharmaceutical jurisprudence which are so closely related to his future interests. Here alone will he work daily side-by-side with the counterparts of his future research teammates. In colleges of pharmacy, the pharmaceutical chemist has a unique opportunity to learn and practice the chemistry of medicinal agents, including synthetic organic pharmaceutical chemistry, in the same frame of reference in which pharmaceutical or medicinal chemistry is practiced by anyone anywhere.

. . . pharmacy is a type of education that cannot be fitted to the individual. It is not an arts and science college in which something can always be found that the student should be able to do, but rather it is a college which selects its students to fit the education it offers; which selects students who, by reason of educational preparation, by character and by cultural background, seem to be fitted to go into what in the future is going to be one of the most exacting of the public health professions.

Harry C. Byrd, Am. J. Pharm. Ed., 2, 496 (1938)

GRADUATE TRAINING IN SYNTHETIC PHARMACEUTICAL CHEMISTRY--A RESTATEMENT OF AN OPINION ON THE SUBJECT*

J. H. BURCKHALTER

For over fifteen years, I have heard a number of organic chemists in industry — and some pharmaceutical educators — repeatedly state that chemical synthesis should not be performed in schools of pharmacy. Finally, I became so weary of these comments that I wrote an article on the subject (1). Therefore, my present words are largely a restatement of the opinions expressed therein, although a recent sabbatical leave in Germany has provided another vantage point from which, I hope, you will view this problem with me. Also, my recent article on graduate study in Germany indicates the practice in Europe concerning synthesis (2).

First, let us examine the possible basis of the attitudes and motives of industrial leaders who feel that synthesis should not be performed in our schools of pharmacy. In my own experience, these usually have been individuals whose entire training was taken outside of a pharmaceutical institution, and it is a rare person who does not defend his particular educational program, for to do otherwise is to condemn one's own judgment. Undoubtedly, a significant number of these critics fail to go beyond this narrow consideration, but others offer strong points in support of their stand.

The organic chemists contend that the synthesis of potential new drugs is nothing more or less than the synthesis of organic compounds. Logically, they argue that the person best trained to perform this function is a man who has studied basic chemistry and has then specialized in organic chemistry. Some of these critics may graciously add that those who would enroll in a graduate program in a pharmacy school would fulfill best the needs of industry if they would direct their interests toward developmental work.

Pharmaceutically trained persons who would eliminate organic synthesis from the graduate curricula are likely to use similar reasoning. However it is difficult to believe that their attitude is always based upon objectivity. Is their willingness to leave organic synthesis to the liberal arts colleges the result of a defeatist's or inferiority complex? Or could it be that their conception of pharmaceutical research is actually limited to their own special division of the pharmaceutical curriculum? If this be a possible explanation please keep it in mind while I speak of the German practice.

If we were to accept the practices of the German universities, our appearance here today to discuss this subject could only be described as uncalled for. And pharmaceutical educators whose field is not some division of chemistry — some of whom criticize synthesis — would be placed in an entirely untenable position, for their graduate programs are nonexistent in Germany. In other words, the removal of synthesis from our graduate curricula would mean that we have deleted essentially the *only* program which most Germans feel belongs in a

*Presented to the Section of Teachers of Graduate Instruction, AACP, Los Angeles, California, 1958.

pharmaceutical institute*. Further, to illustrate the great stress upon this area in Germany, pharmacy is usually taught in an institute for *pharmaceutical chemistry*. In fact, research in pharmacology is taught in a separate institute, pharmacognosy in a botanical institute, and pharmacy (*i.e.*, pharmaceutical technology) not at all, for this last area is considered to be the province of the pharmaceutical manufacturer. Then, one can only imagine how they would feel about a graduate program in pharmaceutical administration.

I have referred to practices in Germany not to suggest that we adopt them, but a recollection of the tremendous impact which Germany has had upon pharmacy will not permit a total disregard of their educational practice, and a consideration of dropping synthesis from a graduate program would be equivalent in German pharmaceutical science to a consideration by their government of the adoption of Russian communism. In other words, such a proposal as we have before us today, I am certain, would shock German pharmaceutical educators. They would surely think that we were mad to make it the subject of a program.

Undoubtedly, one reason why the problem does not exist in Germany is that all doctorates in science are granted by a science faculty, and the examiners come from the various institutes of the faculty. For example, a student in pharmaceutical chemistry is compelled to face examiners from the chemical institute, while in our country apparently many of our schools do not follow this practice, and thus they subject us all to the accusation of exposing our students to watered-down organic chemistry, inferior physical chemistry, or no physical chemistry at all.

Yes, it is true that many of the research directors of pharmaceutical houses have established the practice of employing only organic chemists for research in pharmaceutical or medicinal research. Certainly, this fact is a stern one which does lend support to the contention that we should abandon synthesis in our schools.

In answer to this stand, I wish to quote from my earlier article which was written in support of the retention of synthetic pharmaceutical chemistry as well as pharmacology in our graduate programs (1).

> Research in these important fields — and by pharmacists — is in keeping with the simple fact that pharmacists are expected to supply drugs. In other words, it is our birthright, and pharmacists who would abandon research in these fields are relinquishing this birthright. They are surrendering what is actually and potentially the most fundamental type of research open to them. Contributions in these fields have led to the medically and economically important specialties which make up the bulk of the business of the professional pharmacist. Retention and strengthening of these fields will afford the means of increasing the prestige of the pharmacy schools. To a great extent, any true scientific renown which has come to our schools has come through the contributions of researchers in these fields. Therefore, we should do everything within our power to see that industrial researchers in this fruitful area come from the schools of pharmacy.

I take the liberty of quoting again from my earlier article (1).

> Another reason why we cannot afford to abandon research of this type in our schools is the well recognized dependence of proper undergraduate teaching upon professors who have been well trained in research. Research-minded professors automatically keep pace with new developments in pharmaceutical science, and until all the teaching staff of a school regularly participate to some extent in research, our teaching can hardly be at the peak of effectiveness. Research-minded professors regularly read first-hand information on the chemisty and pharmacology of the constant stream of new organic specialties, antibiotics,

* To illustrate how divergent from this practice a view can be, a paper by Dr. A. N. Martin at one of the recent AACP sessions in Los Angeles proposed that essentially all graduate programs in the pharmacy schools except the one of interest to him, *i.e.*, physical pharmacy, be abolished.

> vitamins and hormones. These men truly are the teachers of modern pharmacy which depends entirely upon the results of research.
>
> With the expected shortage of teachers in the future, the maintenance and improvement of research in these areas in our schools will also afford a supply of well-qualified teaching personnel.

Despite the widespread practice of employment of organic chemists to do research in medicinal chemistry, there are striking exceptions to this rule. I know of at least three departments of pharmaceutical chemistry whose Ph.D. graduates are actively sought by both pharmaceutical *and* chemical firms. What does this mean? It means that those concerns have found that the graduates of these departments have received basic training in chemistry, which is important for any sort of chemist whether he be an organic, physical, biological, or pharmaceutical chemist. It means that these departments require their students to take a number of the basic courses and certain of the preliminary examinations as offered by the departments of the college of arts and sciences. (Certainly, the regular preliminary or comprehensive examination of the organic major should be a compulsory requirement.) Further, it means that certain employers recognize that the Ph.D. products of these departments of pharmaceutical chemistry actually know more *synthetic organic chemistry* as a result of their curriculum and research problems than most majors in organic chemistry. These employers recognize that students who file a thesis on a mechanism problem will be less useful to them than pharmaceutical chemists who know many reactions of organic chemistry from first-hand experience.

Even with improvement in our programs, we shall continue to encounter prejudice against students trained in our schools. Prejudice is the only explanation for such an ironic case as I shall describe. Many research departments in pharmaceutical houses will not consider our graduates for synthetic work saying that they prefer chemists with a major in organic chemistry. Yet these same men who were rejected by pharmaceutical houses have obtained offers from the large, well-known chemical companies because these graduates were considered to have a better background in synthesis. Such deep-seated prejudice can not be easily overcome.

Again quoting from the previous article:

> If we do not wish to abandon research in these important fields, what must be done to strengthen our claim? The first step in any strengthening process is the frank acknowledgement of weaknesses. Any worthwhile group is proud, and we are no exception, for we have been reluctant to admit our weaknesses. But our weaknesses are the sins of our fathers or they were caused by circumstances beyond the control of the pharmacist. The deficiencies in our graduate training, in my opinion, are attributable to the fact that postgraduate training in pharmaceutical subjects is relatively a new phase of pharmacy. The four year program was not fully established until 1936, and four years of undergraduate work has always been required for entry into postgraduate study.

Those departments of pharmaceutical chemistry which wish to retain synthetic programs are obligated to organize proper graduate curricula. Until students are graduated only after having met basic requirements in science and mathematics and having presented an adequate Ph.D. thesis clearly indicative of ability as a full-fledged organic chemist, then we can expect to continue to hear criticism of all programs in this field. Schools which do not adhere to proper standards are causing irreparable damage to those which do. Such schools should discontinue their offerings until they can do highly creditable work.

While speaking of graduate curricula, I think it is opportune to remind

ourselves of the meaning of the Ph.D. degree. It is a research degree, and its holder should have proved himself to be an expert in at least one fundamental area of study. Thus, since pharmacy is a professional field, and, therefore, is a composite of several different basic and practical subjects, it is just as illogical to grant a Ph.D. in pharmacy as it would be in medicine or dentistry. Graduate students in a professional school such as medicine receive the Ph.D. degree in biochemistry, physiology, anatomy, etc., and they must meet the requirements of one of the basic areas of study. Likewise, in pharmacy we have no less an obligation to provide a graduate student with the background of a major program in a fundamental field. After all, if his research is significant, it will necessarily be either botany, pharmacology, biochemistry, analytical chemistry, physical chemistry, or some other distinct field, regardless of what we call it. It follows, then, that the student should be required to pass the identical preliminary or comprehensive examination which the faculty of that basic department in the university requires of its Ph.D. candidates. If the school of pharmacy is located in a city away from the liberal arts college, then it should make certain that its examination will be equally demanding of the student.

Such a program as the one described accomplishes much. It gives the student a basic major field which allows him to compete on an equal footing with others in that field. It makes certain, for example, that the student who wishes to perform synthesis will have the proper background. Even though his major might be indicated as pharmaceutical chemistry rather than chemistry, he will have the training of the organic chemist, which he should have if he proposes to do synthesis. Further, he does not need to apologize to anyone, since he has not taken a program of watered-down chemistry. Indeed, he should hold his head high, look his critic in the eye, and put him to shame. And because of a program of varied courses in his curriculum, his position can be a highly advantageous one.

Any compromising with this plan, which some are wont to do, will fail to solve the problem under discussion. For example, some contend that a highly diversified program without a genuine major field will provide a desirable man. But we should not delude ourselves. We can not afford to let our students become jacks of all trades and masters of none.

I do not wish to follow the lead of those who criticize synthesis in the schools of pharmacy by declaring that research in synthetic drugs should not be conducted in departments of chemistry of the arts and science colleges. However, I do feel that much is to be gained by the student of medicinal chemistry from having his program in the environment of a school of pharmacy. Nevertheless, it is my firm conviction that the spirit of a true university sets no arbitrary boundaries where creativity is concerned. After all, it is the function of a graduate school and not of a school of pharmacy or a department of any school to decide such matters. For this reason, it is actually inappropriate that we discuss this particular topic today. Our subject more properly should deal with the quality of student candidates, the quality and content of the program requirements and the quality of the faculty who are responsible for a program in synthetic pharmaceutical chemistry. If these matters are properly cared for, then there is no need to debate whether or not a school should discontinue offerings in this area. Usually, criticism ceases when there is no longer a reason to criticize.

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THE NECESSITY FOR RESEARCH AND GRADUATE TRAINING IN SYNTHETIC PHARMACEUTICAL CHEMISTRY IN SCHOOLS OF PHARMACY*

W. LEWIS NOBLES

Undoubtedly one of the preempting factors that led to this topic for discussion is the apparent uncertainty in the minds of some — or many — that graduate training in this field is "proper" for schools of pharmacy. Perhaps this was best exemplified by the remarks of Blythe (1) who reported at last year's meeting of this organization on a survey conducted relative to the position of the pharmacy-trained Ph.D. in the pharmaceutical industry.

Among other things this survey pointed to the fact that there were 319 nonpharmacy-trained Ph.D.'s and only seventeen pharmacy-trained Ph.D.'s in the area of chemical synthesis in the fourteen pharmaceutical houses represented in the survey.

Blythe reported: "There is a nearly universal feeling that pharmacy-trained Ph.D. men received an inadequate training in the basic sciences." He further declared that the opinions of laboratory directors and vice-presidents in charge of research on this matter were:

1. There is a deficiency in knowledge in subjects such as organic chemistry, physical chemistry, and biochemistry. Often these courses are taught by pharmacists who are not qualified to teach them.
2. Chemistry units in pharmacy schools are inferior to those in departments of chemistry. Their basic weakness comes from the insistence of pharmacy schools in maintaining their own departments of chemistry.
3. Sound training in organic and physical chemistry is lacking.

It was further suggested by the directors of chemical research in these houses that the organic chemist who is trained in a pharmacy school cannot compare to a man trained in a chemistry department.

This same attitude had been previously noted by Cartland (2) who reported: "When I talk with our chemists, they uniformly answer — the pharmaceutical chemists cannot compete with the best organic, physical, and biochemists which are available from the departments of chemistry." Perhaps not, but need I remind you that the tortoise could not compete — at first — with the rabbit, but he ultimately won the race!

Although Tishler (3) is among those who advocate less emphasis on organic syntheses, he is staunch in his defense of *pharmacy* as the *science and art of preparing, preserving, compounding, and dispensing medicines.* It is at this point that I wish — not to defend — but rather to indicate the *necessity* for such training if pharmaceutical education is to be elevated to its proper domain. Too long we have apparently felt — in too many cases — that there was something sacrosanct about medical education! (This is in no way to imply a criticism of medical education — it is not perfect, but we would do well to emulate the medical schools in many ways.) Will any reputable school of medicine not investigate a basic problem concerning human health no matter how indirectly it may appear to be related to the traditional "practice of medicine"?

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No area should be more sacred to schools of pharmacy than the study of the *preparation of medicines*; which, in large part, implies organic synthesis today.

This is the age of ballyhoo. On the one hand, we are urged to demonstrate professional scientific leadership; on the other, it is suggested that research in schools of pharmacy should be "restricted" to the traditional areas of drug analysis, formulation and stability problems, incompatibilities, etc. I, for one, refuse to accept the view that research in schools of pharmacy should be placed in any such "strait jacket" of empiricism. I am certain that some of my colleagues will not agree with some of the things I have to say, but we have this in common: each of us is seeking to discover for himself the most satisfactory equation for living, and to aid others toward this goal. It has been reported that in 1940 the total sales of our pharmaceutical industry were $149,000,000. Today, the research budgets of this same industry approximate $127,000,000. It would appear inevitable that we should experience a concomitant increased interest in research in the areas dealing with medicinals, in our university, as well as industrial, laboratories.

Frankly, however, some pharmaceutical educators and many representatives of chemistry departments would suggest that such research may be best conducted outside of the schools of pharmacy. It is not surprising then that many industrialists and educators seriously question the propriety of such research in schools of pharmacy. If pharmacy is to provide its expected leadership in this important period of history, we should not meekly seek piously to retain — but vigorously reacclaim our right to a just portion of our heritage — the right of having a part in the preparation of those who will prepare our synthetic medicinals of tomorrow. We have a most extraordinary birthright; pottage was tempting to Esau, so let us examine carefully that for which we would trade! Birthrights are hard to come by, but their selling price is sometimes very cheap!

The primary purpose of graduate training in pharmaceutical chemistry is to prepare one for a lifetime career in research in this area. An active faculty research program is not just desirable — it is essential to a successful graduate program. The neophyte should be so introduced to the field — by actual research — that he will fully sense the obligation he has assumed — *research* as a lifetime career! The layman endorses research because he sees the direct results of it in his daily life. This is not invariably true of all research, however! Sometimes research "pays" and sometimes it doesn't, but the true researcher is *not* concerned with whether or not it pays. When Galileo studied the swinging pendulum, when Copernicus formulated the heliocentric theory, when Newton "pulled" the planets into courses amenable to mathematical rules, when Einstein wrote an equation that converted matter into energy, they were not interested in the practical consequences of their work. Just so, the "practical" values of research and graduate training are not always evident — particularly in a materialistic society. Nonetheless, vistas of unlimited vision should be opened to those who enter therein.

To gain a proper perspective of our position, allow us to examine the past and present. The first earned Ph.D. degree in the United States was awarded by Yale University in 1861. Forty-one years later the first doctorate in an area of pharmacy was awarded by the University of Wisconsin. At the annual meeting of this section in Pittsburgh in 1946, Daniels (4), after outlining a program for graduate training in pharmaceutical chemistry, said, "It should be remembered that pharmaceutical chemistry as outlined here is largely for the future." Two years later, at the San Francisco meeting of this section — just ten years ago — Hartung (5) related the experiences of some sixteen of the students who had been awarded

the Ph.D. at Maryland. The general objectives of the program had been very acceptable. In the discussion that followed, Bauer (5) pointed out that teaching pharmaceutical chemistry at the graduate level was a relatively new assignment for many schools. Thus, at the end of little more than a decade are we ready to "throw in the sponge"? I am forced to give an emphatic "NO" at this juncture!

Allow me quickly to state that if we honestly face the facts of what we have accomplished — and the opportunities missed — there is no place for smugness or complacency! We have made our mistakes, and our programs have had their weaknesses. A frank recognition of weakness should not be the reason for despair, however. Our weaknesses have largely been those over which we have had little or no control. They are "the sins of the fathers visited upon the third and fourth generations." Kuever (6), with respect to the AACP once said, "If anyone doubts that progress has been made, let him look back and see where this Association came from." His remarks are equally applicable to pharmaceutical education today. Prior to the post World War II period, pharmaceutical education, in general, suffered by comparison with the basic sciences from the lack of well-qualified faculty and administration. Students who were thus trained in a mediocre environment tended to perpetuate the mediocrity (7). This situation is now markedly improved and should continue to be so.

A program of graduate training in the synthesis of organic medicinals is vital for those schools which are willing and able to support it. Such a program is essential for the following reasons:

1. It is an integral part of the university graduate school and lends itself admirably to interdepartmental collaboration.

2. This type of training and research is fundamental to our schools of pharmacy.

3. Such a program stimulates the faculty member to bring something of the aura and mystery of research in these areas into each teaching situation. It will evoke more inspired, informed, wide-awake instruction.

A modern program by virtue of the courses available and the research possibilities offered *will* qualify the graduate admirably for teaching or industrial activities. This will ***not*** result in an atmosphere in which the following statement — or its prototypes — are heard with far too great frequency — "The chemistry department no longer teaches elementary (or organic, analytical, or physical) chemistry in a manner suitable for training pharmacists." Insofar as such physical and chemical properties of aromatic compounds as solubility, acidity, nucleophilic substitution, etc. are determined by resonance and the electrophilic properties of the molecule, it is not inconceivable that electron transfer or oxidation-reduction potentials within enzymes could be disturbed by one or more of these factors. Our concept of organic medicinals should thus be oriented in this — as well as other — directions. The era of the test tube and Bunsen burner has now given way to atomic reactors, counter current distribution techniques, and electronic instrumentation never before dreamed of. Just so, should our concepts of research and teaching be constantly adjusted so as — not merely to keep pace with but — to keep our programs in the forefront.

Such a program should provide scientists who are able, simultaneously, to evaluate the chemical and biological factors in a particular problem. Thus, in the field of medicinal chemistry, our schools of pharmacy — through sound graduate programs in pharmaceutical chemistry — should be able to elevate us to the position of leadership which is rightfully ours — if we face fearlessly and real-

istically the problems to be encountered. The old distinctions which led to arbitrary classifications such as biochemistry, pharmacology, etc. are breaking down to give rise to such more modern concepts as biological antagonism. This, an old science under a new name, cuts across the borders of many classical areas of science; it is a science based on fundamental concepts and not upon lines drawn in the cloudy sphere of didactic empiricism (8). In such an area, graduates of a program based upon strong fundamental chemistry and oriented in the proper direction by an interest in — and concern for — physiological processes should provide the creative leadership demanded.

Certain factors should be realized and dealt with realistically in our programs of graduate training in synthetic medicinal chemistry. They are not unique to this one area, but are shared — more or less — by all. These include:

1. A person devoid of imagination should never be awarded the doctorate degree with the mistaken impression that he will *make* a *good* teacher anyway!

2. A keen interest should be cultivated in the mind of the graduate student for those basic sciences upon which the special interests in medicinal chemistry may be cultivated. This interest should be nurtured into a real proficiency in these areas.

3. The importance of breadth and depth in training is only now coming to be generally appreciated. Graduate students ***must not*** be allowed to work on rather narrow developmental projects — only following the footsteps of others.

4. To be vigorous and productive the ideas and methods of one's specialty should be "crossbred" with fundamental ideas and methods derived from companion sciences and technologies.

The function of maleic hydrazide as a plant growth inhibitor is well known as is the plant growth stimulant effect of gibberellic acid. May we then implore the Almighty to give us more and more the effects of gibberellic acid and less and less those of maleic hydrazide insofar as our vision is concerned with respect to developing and maintaining a sound program of graduate training in synthetic medicinals.

In last year's meeting, Blythe (1) indicated that if the opinions of the respondents (with respect to the position of pharmacy-trained Ph.D. men in industry) were wrong, there is a real need and opportunity for correcting this opinion through a public relations program.

It is my opinion that our position — as outlined in the topic of this paper — is ***not*** untenable. We must study our programs, reevaluate them, "cross-breed" them, and in every possible way, continue to improve them — and the public relations aspect associated therewith. We must not . . . "sit idly by, engaging in wishful thinking, vainly hoping for some miracle" . . . to come to our aid!

We must, however, reassert our desire to work hand-in-hand with our colleagues in education and industry to the end that our programs of graduate training and research in the synthesis of organic medicinals need not be apologized for — if, indeed they need be at the present time.

Perhaps I have not yet presented a convincing argument for graduate training in pharmaceutical chemistry. I might not be able to give absolute proof for some of my beliefs in Christianity. Nonetheless, I accept them wholeheartedly; just so, I believe in a program of graduate training in synthetic organic medicinals.

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These and other factors of the ever present and never ending contest for land, for power, for wealth are conspicuous and picturesque. They seem to control and subordinate other factors to themselves. Yet there is still another influence so widespread, so insidious, so gradual and universal that it is even assigned a secondary position as a necessary part of life which may be left out of consideration because of its inevitable character. I refer here to the warfare with disease and death.

Henry Baldwin Ward, Am. J. Pharm. Ed., 4, 6 (1940)

PHARMACEUTICAL CHEMISTRY AND THE SEMINAR FOR PRACTICING PHARMACISTS: A PROBLEM IN COMMUNICATION*

EDWARD S. BRADY

Among the varied responsibilities of the teacher of pharmaceutical chemistry is his participation in the educational program for the practicing pharmacist. It is almost certain that at some time during the academic year he will be requested to appear at the annual "refresher" seminar, be asked to join a panel discussion at the state convention, or be invited to serve as a guest speaker for a local pharmaceutical society. In most instances he will be expected to present material which falls in his specialized area of teaching, and, with the average group of listeners, will find himself face to face with a serious problem in communication. Serious indeed, because as a representative of his specialty, his faculty, and his school, the impression he makes during his presentation inevitably reflects upon these other entities. The average practicing pharmacist has but few contacts with pharmaceutical educators, and from these isolated contacts he forms his opinion of pharmaceutical education as a whole. His opinions cannot be dismissed lightly, for we must often turn to him for moral, financial, and personal support of certain phases of our educational programs. While much of the misunderstanding which seems to exist in certain local areas between the educator and the practicing pharmacist may simply be due to total lack of contact, we should make certain that it does not arise from unfortunate contacts, one of which may be the presentation of topics in pharmaceutical chemistry in an unintelligible and incomprehensible fashion. It is the purpose of this discussion to offer suggestions which, if followed, may improve the communication between the pharmaceutical chemist and his audience of practicing pharmacists.

The Audience. The typical audience of pharmacists presents a cross-section of today's practitioners. Recent graduates will be numbered among those present, and in background and habit they will be eager to understand and follow almost anything that is presented in an interesting manner. Those not-so-recent graduates who have been out of school from five to fifteen years will require some review before new subject matter can be given, but it may be assumed that they have the proper background for understanding and relating new material. It is likely that about one-third of the group will have had no formal training in pharmaceutical chemistry, yet they may represent the more substantial members of the profession, and they often operate the most professional type of store. It must be presumed that they are in the audience to learn, and because they wish to take useful information away with them. It is this older group that presents the real challenge to the speaker, and, in my opinion, the presentation should be directed at this group. Their presence and interest cannot be ignored, and it is a demonstration of ineptitude on the part of the speaker if he approaches his subject with the feeling that the older pharmacists represent a group of "unteachables."

The Speaker. The other half of this problem in communication is the

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speaker himself. We individually, and as a group, represent his many shortcomings. He does not generally find himself chosen as a speaker because of his beauty, wit, or oratorical excellence. It is presumed that as a college teacher he is qualified to present a subject to an audience in a clear and intelligible manner, but he is often judged upon factors other than his knowledge of his subject. Mannerisms, poor diction and habits of speech, and other factors which he may have inherited or acquired can often detract from an otherwise excellent presentation. While the general rules of public speaking need not be repeated here, they certainly apply even to the pharmaceutical chemist, and he should strive to observe them and improve his presentation. Success in the classroom does not always insure success on the seminar platform, for students can adjust to mannerisms and defects in a teacher because of their frequent contact with him. A new audience does not have the opportunity to do this, and the personal quirks which may endear a professor to his pupils may only annoy a group of more mature pharmacists. Steps toward improving presentation may be taken through the solicitation of constructive criticism from other faculty members, and an honest appraisal of an on-the-spot tape recording of one of our talks can bring about much that is self-enlightening. Since the communication of the ideas that we are asked to present depends so much upon our oral presentation of them, every effort should be made to improve ourselves as speakers.

The Subject. Few speakers can transcend the limitations imposed by a poorly chosen subject. The paramount criterion for the selection of a topic for discussion with practicing pharmacists should be the immediate usefulness of the material to be given. Educational philosophies which motivate our choice of subject matter for the classroom must be reconsidered in our approach to the pharmacist who may devote only a few hours each year to postgraduate study. If each speaker would ask himself this question, "Is this material the most valuable which I can present to the pharmacist during the time he listens to me each year?" much would have been accomplished toward a sensible and worthwhile choice of a topic and the subsequent development of it. This outlook would relegate to the graduate seminar the research interest of the speaker, the twenty-three step synthesis, the family of compounds developed but never marketed, and like material of considerable academic but little practical interest. We cannot afford to become so absorbed in our own particular specialty that we lose appreciation for the educational needs of the pharmacist, and we must try to meet those needs in the small space of time allotted to us.

The Presentation. If the yardstick of usefulness as outlined above is applied with rigor to each aspect of our presentation, it will be seen that the form and material of this postgraduate "paper" will vary considerably from one presented to a scientific journal for publication. The long historical introduction may be omitted entirely, or only as much retained as is required to relate the new material to things already a part of the pharmacist's experience. Discussion of syntheses *per se* may have to give way to chemical information regarding the stability and incompatibilities of the compounds under discussion. Unusual terms must not only be defined, but redefined each time they are used, and sometimes avoided entirely. Our classroom vocabulary should be screened, and technical terms which "every student knows" should be reexamined to make certain that every pharmacist knows

them, too. Structural formulae should be simplified as much as possible. It is not difficult to negate completely the usefulness of structural comparisons by presenting detailed graphic formulae, correct down to the last hydrogen atom, which so ensnare the attention of the audience that the important variations go unnoticed. Where possible, blocked-out basic structures should be used, so that the only details visible are those which are truly pertinent to the point being made. Statistical material is much better presented in the form of line or bar graphs than as numerical tables, and legends should be kept at a minimum on all graphic material. Simple, direct presentation should be the objective of each word or picture, and the further we stray from this ideal the less comprehensible we become. Above all, every effort should be aimed at relating new facts to material already known, or recalled by review, by the pharmacist. This relating and grouping of ideas, the tying of new information to old, the association of the recent drug with the drug handled daily on the prescription case, this fusing of concepts is the most useful method of approach, and may well be the only method which can be used with success in postgraduate education.

The pharmaceutical chemist may often find it necessary to trespass verbally on the other divisions of pharmacy, for unless he is presenting the chemical aspects of a subject which also will be discussed by the pharmacologist and the pharmaceutist, he may fail to satisfy his listeners. While we may not consider ourselves qualified to explore the more profound pharmacological actions of a drug, we cannot avoid the mention of use, side effects, and dosage, nor the comparative medical advantages of the members of a group of drugs if we are to do full justice to our subject. This fact might often influence the selection of a topic, for many new compounds are primarily of pharmacological interest, and the pharmacist may gain but little from a full lecture devoted to their chemistry. The "practical" pharmacy aspects of a group of new compounds also should be included, for the trade names, manufacturers, dosage forms and sizes, and legal classification may be of considerable importance to the pharmacist. In fact, the consistent use of trade names may be an advantage, since it may eliminate a possible point of confusion in an audience not as well versed in generic and chemical names as we are apt to presume.

If the observations made in the foregoing paragraphs seem to doom the speaker on chemical topics to second-rate materials consisting of excerpts read from manufacturers' catalogs and apologetic monosyllabic references to oversimplified graphic structures, such was not their intention. Probably no other field of pharmacy has so much to contribute to the over-all understanding of new drugs and techniques as the field of pharmaceutical chemistry. For in our area there are few new drugs, but many first cousins of compounds we already know, and there are no unique incompatibilities, but only foreseeable reactions based on well-known physiochemical principles. Rather, it is our responsibility to communicate these principles and relationships to the practicing pharmacist in an enthusiastic and lucid manner, and to strive to extend and expand his knowledge during his years of professional service. A teacher can meet no greater challenge than imparting knowledge to those who are difficult to teach, and our practicing pharmacists can be the shining examples of our skill in communication in the field of pharmaceutical chemistry.

PHYSICAL CHEMISTRY IN PHARMACEUTICAL EDUCATION*

FRANK M. GOYAN

A survey of course titles listed in the announcements of schools of pharmacy throughout the United States provides convincing evidence that the pharmacist of the future may be as well educated in science as any other college graduate who majored in scientific subjects. This is as it should be. The general public needs frequent and familiar contact with persons whose independent scientific judgment can be trusted. Without some local leadership of this type, the average citizen finds it difficult to distinguish between honest scientific progress and the extravagant claims of the pseudosciences. By virtue of his strategic position in the community, the pharmacist is ideally suited to exercise this leadership if his educational background is adequate.

There is another equally compelling reason to look to the future pharmacist as a man of science as well as a skilled dispenser of medicine. Scientific medicine is progressing at such a rate, especially in the field of pharmaceuticals, that the average physician cannot hope to be in position to exercise independent judgment in the selection of new remedies. He is forced to call for help, but he cannot be expected to seek the help of a poorly educated person in matters involving judgment.

If the pharmacist of the future is to be prepared to take advantage of his opportunities for scientific leadership, his present teachers must be sympathetic with his need for a thorough education in the fundamentals of science as well as his need to find an opportunity to become familiar with the daily routine of the modern pharmacy. The balance between fundamental education for the future and training for today's job must always be held in proper perspective. It is not easy to accomplish this. However, pharmaceutical educators have recognized this need and have devoted an immense amount of time and thought to the problem. The monumental work by Blauch and Webster (1) has made the best of this thinking freely available.

Curriculum planning at the University of California School of Pharmacy has been guided by these concepts. Table I has been designed to display the essential features of this curriculum. The section on general education represents two years of preprofessional instruction at any accredited college or university. However, beginning courses in the physical science sequence and in the biological sequence are also required during this period. The subjects following general chemistry in the first column of Table I are presented during the first three years of the professional curriculum at San Francisco. The fourth year of the professional curriculum is devoted to advanced courses, many involving specific applications of basic scientific principles to pharmacy.

TABLE I

A CURRICULUM FOR PHARMACY

I General Education		
Language	*Literature and Arts*	*Humanities*

* Presented to the Section of Teachers of Chemistry, AACP, Los Angeles, California, 1958.

II Scientific Education and Professional Training

Physical Science	*Biology*	*Pharmacy*
Mathematics	Zoology & Botany	Pharmacy —
Physics	Anatomy & Histology	Orientation
Chemistry —	Physiology	Calculations
General	Biochemistry	Preparations
Analytical	Pharmacognosy	Administration
Organic	Microbiology	Law
Physical	Pathology	Dispensing
Pharmaceutical	Pharmacology	Formulation

III Supervised Professional Applications

Table I represents with fair accuracy recommendations which are being put into practice in the great majority of schools and colleges of pharmacy throughout the United States. Although, in many schools, physical chemistry is not represented by a course bearing this title, the subject itself is an essential part of each curriculum. A knowledge of physico-chemical principles is prerequisite to an understanding of biological phenomenon as well as analytical and formulation procedures used in pharmacy. These essential principles are sometimes presented in courses bearing a pharmacy title, such as physical pharmacy. The author offers no criticism of this practice because the basic scientific principles remain the same, regardless of course title. However, this tolerant attitude could not be extended to include attempts to present advanced applications of physical chemistry to students who had never been given the opportunity to study the fundamental principles of the subject.

OBJECTIVES, BACKGROUND AND INTEREST

Physical chemistry or physical pharmacy should have as its primary objective the furtherance of the scientific education of the future pharmacist. To discover topics in this field of importance in the modern curricula of pharmacy, one has only to read the tables of contents of standard textbooks in physical chemistry. At the University of California School of Pharmacy, we are currently making use of the textbook, *Physical Chemistry* by Daniels and Alberty (2) and the laboratory manual, *Experimental Physical Chemistry* by Daniels, Mathews, Williams, Bender, and Alberty (3). There are no topics included in these books, or other standard textbooks in the field, that would not contribute to the education of the pharmacist if they were thoroughly mastered. However, there are practical limitations of time, intellectual capacity, and interest that must be taken into consideration. It goes without saying that it is better to master a few basic principles than to spend the same time obtaining a superficial knowledge of many topics.

The greatest challenge encountered in presenting a course in physical chemistry to students of pharmacy is the problem of creating and maintaining student interest. This is a complex problem and one that must be solved if the time spent by the students is to yield commensurate rewards. When confronted with a problem of this nature, the author makes use of a simple but important principle that is often overlooked, namely that students are people. People take pride in learning for its own sake and take special pride in the belief that they know their own field very well indeed. With this thought in mind, the student must be told the truth about his curriculum in terms of its far-reaching educational objectives. He must capture in his imagination the picture of himself as a person of profes-

sional standing who is held in high respect because he is well able to bear the responsibility of exercising good judgment in scientific matters pertaining to the health and general welfare of his neighbors. He must be convinced that physical chemistry is a science closely related to pharmacy. This is easily accomplished by insisting that he compare a standard textbook in physical chemistry with such books as *Remington's Practice of Pharmacy* (4) or *Textbook of Pharmaceutical Compounding and Dispensing* (5).

Although it is true that the principles of physical chemistry are called upon daily in the practice of pharmacy, it is not true that the pharmacist of today needs to take a course in physical chemistry in order to learn to perform his routine duties successfully. The student's reward for mastering elementary physicochemical principles will be an increased understanding and better judgment in dealing with many future problems related to his professional career, both before and after graduation. There are few students who are not interested in basic science related to pharmacy, but there are many who will not admit to this interest until they are sure it will not end in frustration.

One common source of frustration among pharmacy students taking physical chemistry is difficulty with mathematics. This difficulty is minimized by requiring courses in mathematics through elementary calculus, as a prerequisite to the course in physical chemistry. However, passing grades in a few courses in mathematics are not sufficient guarantee that students who have earned them will not forget essential mathematical skills or fail to recognize the need for them. Many courses in the pharmacy curriculum demand a somewhat different type of study which involves memorization of a large number of equally important items. On the other hand, physical chemistry requires very careful memorization of a relatively few basic principles which must be applied again and again to different situations. Students often require help in getting started with this mathematical approach even after they have passed courses in elementary calculus.

SYLLABUS AND COURSE CONTENT

Orientation of the type suggested above is a valuable aid in stimulating initial interest, but it cannot be expected to sustain this interest unless the course of study fulfills the promise that it will provide some measure of understanding and sense of accomplishment in line with the goals the students have selected for themselves. In order to meet this challenge, the author has found it necessary to write a syllabus covering a portion of the course (6). This syllabus outlines the course of instruction to be presented and provides suggestions for laboratory work.

Laboratory experience in physical chemistry is invaluable in stimulating interest, especially when it is possible to use instruments and related experimental techniques often mentioned in the official and scientific literature of pharmacy. The syllabus contains a section devoted to experiments dealing with buffers, colloidal systems, phase equilibrium, etc. It also provides specific directions for preparing samples for instrumental analysis together with short statements concerning the principles involved in the use of over twenty instruments. The syllabus itself is inadequate, but it is supplemented by exact references to the laboratory manual (3) and other reference material. Reports written by students and organized instruction by students also prove to be helpful.

Didactic instruction in physical chemistry for students in schools of pharmacy should not differ in essential quality from instruction in elementary physical chemistry offered to students majoring in other scientific subjects. By providing

clear statements of principles and a series of elementary examples involving calculations, the syllabus helps the student acquire the habit of study that is necessary in working with mathematical subjects. However, every effort is made to lead the student to a true intellectual interest in the subject for its own sake without detracting from his original interest in possible pharmaceutical applications. Table II is taken directly from the syllabus and shows that the material presented follows a reasonable outline for a course in elementary physical chemistry.

TABLE II

DIDACTIC INSTRUCTION

I Equilibrium and Rate of Reaction

A. The First and Second Laws of Thermodynamics
(Energy and Equilibrium)
B. Equilibrium between Phases
(Phase Diagrams and Transition Points)
C. Equilibrium in One Phase
(Chemical Equilibrium)
D. Rate of Reaction
(Chemical Kinetics)

II States and Properties of Matter

A. The Colloidal State
(Colloids and Colloidal Chemistry)
B. The Gaseous State
(Gas Laws and Kinetic Theory)
C. The Liquid State
(An Intermediate State)
D. The Solid State
(Crystals)

III Solutions

A. Methods of Expressing the Composition of Solutions
(Molality, Mole Fraction, etc.)
B. Ideal Solution Laws
(Distillation Studies)
C. Colligative Properties of Un-ionized Solutes
(Osmotic Properties)
D. Ionic Solutions
(Osmotic Properties of Electrolytes)

IV The Influence of Heat, Light and Electrical Energy

A. Electric Conductance of Solutions
(Ionic Conductance)
B. Chemical Thermodynamics
(Applications of the First and Second Laws)
C. Electrode Potentials
(Free Energy and Electromotive Force)
D. Photochemistry, Photometry and Polarimetry
(Optical Methods)

The material outlined in Table II is presented in approximately thirty one-hour lectures. Each subdivision headed by a letter in the table represents several pages of mimeographed material in the syllabus. Definite reading assignments and problem-set assignments are provided for each subdivision, but the student is encouraged to become increasingly independent of the syllabus as he becomes more familiar with his textbook. The second part of the course is not defined by this syllabus, although there is some overlapping. Its principal objective is to make the student feel quite at home with the standard textbook presentation of such subjects as chemical kinetics, colloidal chemistry, electrochemistry, and nuclear chemistry. The second part of the course is also oriented toward pharmacy without detracting from its primary objective of presenting fundamental physical chemistry. Dr. L. D. Tuck has been responsible for developing many of the lectures dealing with these topics.

SUMMARY

The point of view presented above is summarized by a policy statement taken from the syllabus (*7*).

> It must not be assumed that the policy of developing a course in physical chemistry along more or less conventional lines has in any way detracted from its applicability to pharmacy. Although every effort has been made to give emphasis to topics of special interest in pharmacy, the fundamental principles presented in the course are of far greater value. Students must never lose sight of the fact that the principles of science which they master today will be valid and usable tools of thought and judgment on the day they retire from active professional work. Furthermore, these same principles and methods of thought are essential to their further progress in advanced courses in pharmacy.

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To my knowledge, big buildings and small men have never made great institutions.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 298 (1941)

PHYSICAL PHARMACY: PHYSICAL CHEMICAL PRINCIPLES IN PHARMACEUTICAL SCIENCE*

ALFRED N. MARTIN

In an effort to keep abreast of the rapid advances in the medical sciences the pharmacy curriculum has undergone many changes during our century. We can perhaps accept the year 1910, when the first edition of the *Pharmaceutical Syllabus* was published, as the beginning of a more or less unified pharmaceutical curriculum. The organic pharmaceutical chemist was applying the principles and techniques of organic chemistry in pharmacy at the turn of the century, and a course in this subject, preceded by inorganic and organic chemistry, was included in the first edition of the *Pharmaceutical Syllabus*. Likewise, the course in drug analysis was introduced early in the century, and it too was blessed from the beginning by the prerequisites of qualitative and quantitative chemistry.

But it was not until the present decade—some forty years after the beginning of an organized pharmaceutical curriculum—that physical chemistry and physical pharmacy were widely considered as desirable courses.

The results of the Pharmaceutical Survey together with the reevaluation of our curriculum and the resultant extended program have shown us the inadequacies in our own areas of instruction and have brought pharmacy and pharmaceutical chemistry considerably closer together. It is not surprising that in this period of critical appraisal the teachers in both areas would realize that they have left out a very important ingredient in the educational recipe of the pharmacy student.

Although the pharmaceutical chemist could have put physical chemistry to good use in his teaching on many an occasion, he no doubt made a lesser error in ignoring it than did the pharmacy teacher. For, physical chemistry is the very foundation on which much of the science of dosage forms and the administration of drugs is built.

The study of physical chemistry requires a knowledge of some calculus, and the course in physical chemistry itself involves some abstract principles which are difficult to grasp when approached for the first time. Unfortunately, these courses have a reputation of being "tough," and for this reason and others they have been barred from our curriculum now for half a century.

INTRODUCING PHYSICAL CHEMISTRY AND PHYSICAL PHARMACY INTO THE UNDERGRADUATE CURRICULUM

In 1948, the Committee on Curriculum of the American Association of Colleges of Pharmacy reported (1) on a proposed two-year prepharmacy and a four-year professional curriculum. Calculus, physical chemistry, and physical pharmacy were included in the outline of suggested courses. Then, at the Teachers' Seminar on Pharmacy at Madison, Wisconsin, in 1949, courses in physical chemistry and physical pharmacy were discussed by Goyan (2), Higuchi (3), and Busse (4). The following year at the meeting of the American Association of Colleges of Pharmacy, Busse (5) presented a paper in which he outlined a course in physical pharmacy and defined the subject as the application of physical chemical principles and laws to the preparation and study of phar-

*Presented to the Section of Teachers of Chemistry, AACP, Los Angeles, California, 1958.

maceutical systems. *The Pharmaceutical Curriculum,* written by Blauch and Webster (6) and published in 1952, recommended a four-semester-hour course in physical pharmacy with courses in calculus and physical chemistry as prerequisites. Since that time various proposals have been made for introducing these subjects either separately, or in an integrated form, into the pharmaceutical curriculum.

Marcus (7) reported on an attempted integration of pharmaceutical preparations, pharmaceutical technology, and physical pharmacy, based on prerequisites of chemistry, physics, and calculus. He concluded that the course was not successful because of significant differences in the course material of pharmaceutical preparations, technology, and physical pharmacy. In a later report (8) he suggested that physical pharmacy be taught as a separate course, preceded by calculus and physical chemistry, as had been proposed earlier by Blauch and Webster.

In 1956 Higuchi (9) suggested a four- or five-credit undergraduate course in physical chemistry, two hours a week of which would be devoted to the study of higher mathematics.

At the 1957 meeting of the American Association of Colleges of Pharmacy, Biles (10) reported on a physical pharmacy course, preceded by an elementary three-credit course in physical chemistry, which is now being taught at the University of Southern California.

The apparent difficulties and confusion in introducing physical chemical principles into pharmacy should not appear discouraging to teachers in this area. Local conditions will differ, and while some may be able to develop a sequence of courses along the ideal lines proposed in *The Pharmaceutical Curriculum,* others will be faced, for the present, with teaching physical pharmacy without the desired prerequisites. Some may perhaps teach an integrated two-semester course in which it should be possible to include some introductory calculus, selected topics of physical chemistry, and pharmaceutical applications based on these principles. Such a course might be called *physical pharmacy* or *physical chemistry in pharmacy,* and it could be taught by a physical chemist in the pharmacy school or a pharmacy teacher with adequate background in physical chemistry. I hope that we will continue to experiment with a variety of courses and teaching methods in this area, for the pharmacy curriculum must always embody sufficient flexibility to meet the changing trends of science.

PHYSICAL CHEMICAL PRINCIPLES IN THE GRADUATE CURRICULUM

In the graduate program, the differences between pharmaceutical chemistry and pharmacy become less clear than in the undergraduate curriculum, and the teachers in these fields as in all areas of pharmacy should join in an effort to broaden the base of graduate education.

The broader approach in graduate teaching is possible, and indeed it is necessary today because of the physical chemical applications which are rapidly changing pharmacy's complexion. A distinct body of concepts and methods, fundamental to and unique with the field which we shall refer to here, not as pharmaceutical chemistry or pharmacy, but as pharmaceutical *science,* is gradually developing out of the older art and technology of our profession. Some of these applied principles are:

(a) The kinetics of drug absorption, distribution, elimination, and decomposition.

(b) New accelerated testing methods for estimating shelf lives and expiration dates of marketed drug products.

(c) The development of time-disintegration and the controlled release of medication from tablets, granules, suspensions, and gels.

(d) The applications of interfacial properties, particle size analysis, and rheological methods in the formulation and production of pharmaceutical dispersions.

(e) New principles of solubilization and emulsification.

(f) The application of metal ion and organic molecular complexing in altering solubility, increasing stability, and modifying action of drugs.

(g) New concepts of isotonicity.

Other changes are also becoming evident in pharmaceutical science. We can expect to witness increasing application of molecular and electronic views in the place of the phenomenonological approach of the past. For example, in the study of the rheological properties of pharmaceutical dispersions and sedimentation in suspensions, molecular properties rather than gross aspects must be considered. The action of emulsifying and solubilizing agents is only now becoming understood in terms of molecular orientation and electrostatic interaction forces.

Graduate education in many areas of science, including pharmacy, has become a narrow road to technical specialization and empiricism, and teachers have become specialists teaching others to become specialists. The salvation from this ever-tightening spiral in the graduate pharmacy curriculum must come soon, or we shall have difficulty in finding a place for our graduates in the rapidly changing pharmaceutical industry.

I am concerned about the possibility of industrial companies hiring chemists and chemical engineers in preference to pharmacists, should our colleges, in this feverish time of curriculum building, try to peddle outmoded and shopworn courses clothed in shiny new titles. Some schools already have begun to institute courses in the second college year, which are labeled "physical pharmacy." At this low level, the course can be little more than the old principles-and-processes course with a new title. If we fail to heed this warning and offer superficial or substandard courses, particularly at the graduate level, it is quite possible that the pharmacist of two decades hence will find himself unable to compete with the chemist and chemical engineer in the pharmaceutical industry.

Industry can hire a vocationally trained technician to prepare buffer solutions, manufacture tablets, or assay the ingredients of a multivitamin preparation. The great demand is not for people with still higher vocational training, but rather for pharmacists and pharmaceutical chemists with a broad knowledge of physical and colloid chemistry, medicinal chemistry, biochemistry, pharmacology, and a familiarity with pilot plant operations and equipment. Still more important is the need for men and women with fresh views and a good measure of creative imagination.

According to Dr. Cartland (11) of the Upjohn Company, the pharmaceutical scientist in industry is living in a society of specialists, most of whom are more highly skilled in chemistry, physics, pharmacology, and bacteriology, having specialized three to four years in graduate school to attain this level of ability, and the pharmacy trained man is not well accepted in these areas in industry.

The pharmaceutical chemist cannot compete with the best organic chemists who have been trained in the departments of chemistry, and the pharmacologist from the pharmacy school cannot compare with those from medical schools with training in human anatomy, pathology, and clinical research. We must realize that this is the general consensus in industrial pharmacy today, bitter as the pill may be for some of us to swallow. The situation has been developing for some time, and I am glad that industrial representatives are finally stating it in a frank and honest manner.

Contrary to the reactions that some pharmacy educators may have to this statement, the condition is not to be lamented. The place of today's pharmaceutical chemist is definitely in product research, development and production divisions and closely allied areas such as drug control. By accepting positions in these branches of industrial pharmacy, our graduates are not reducing themselves to the place of second-class scientists. In this day when most pharmaceutical specialties are short-lived, new formulations giving prolonged blood levels, providing convenience in handling, and supplying stable and active medication to the patient are in constant demand. The pharmaceutically trained scientist who can solve these problems performs a vital function in industry and in his society, and he applies knowledge, imagination, and skill equal to that required by his colleagues in related sciences.

Rather than bemoaning our fate, we would better spend our time and effort preparing our graduate students for the now clearly defined place that they will assume in industry. We must not let our pharmaceutically minded students sacrifice a broad education in basic and applied sciences for specialization in organic chemistry or medical pharmacology, in order to compete with other scientists for a place in industry. To combat this possibility the faculties in our respective colleges should study and review their graduate programs with an eye to refreshing and remodeling them in the light of present trends and future needs. The committee on Graduate Study of the AACP is now actively studying the problems of graduate instruction and should provide needed guidance in this direction.

I would like to see our graduate program represented as a unified field of *Pharmaceutical Science*, which in turn might be divided for teaching and research into the several areas of Applied Physical Chemical Sciences and Applied Biological Sciences. Graduate courses in the Applied Physical Chemical Sciences would include instrumental analysis and control, organic medicinal products, isotope tracer technics, industrial operations and processes, and physical pharmacy, all based on a firm background of calculus and physical chemistry. The Applied Biological Sciences would consist of courses in pharmacology, pharmacognosy, physical biochemistry, and microbiological applications to pharmacy. This area also would be strengthened greatly by the requirements of calculus, physical chemistry, and statistics.

The term *Pharmaceutical Science* would signify that our graduate program was a unified body of applied sciences rather than an ambiguous array of unrelated technologies and practices which now include manufacturing pharmacy, hospital pharmacy, pharmaceutical chemistry, pharmacology, and pharmacognosy. The term, pharmaceutical science, emphasizes the fundamental character of the knowledge acquired by the graduate student rather than giving a description of the job that he will fill after graduation.

Until pharmaceutical science establishes its own principles and theories

founded on the basic sciences of physics, chemistry, biology, and mathematics, it cannot expect to attract the best-qualified students who will be willing to spend eight years or more in college to attain their goal. Only after we have clarified our role among the applied sciences, blocked out an area of knowledge which is unique to pharmaceutical science, and educated our graduate students in this field, can we expect rapid progress comparable to that in the vigorous young sciences of biochemistry, biophysics, and modern chemical engineering.

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. . . it takes infinitely more labor, more wisdom, more patience, and more cash to establish and maintain that social and intellectual soil and climate necessary for the development of the finest qualities of man.

Anton J. Carlson, Am. J. Pharm. Ed., 5, 298 (1941)

A COURSE IN DRUG ASSAYING BY FUNCTIONAL GROUP ANALYSIS*

J. E. GEARIEN

Knowledge is potential power, but if it is to be activated, the salient facts and theories of which knowledge is composed must be applied and utilized in a meaningful manner. When a student can do this, learning becomes a part of his growth and development. The possession of knowledge does not insure the ability to apply it. Students should be instructed in the application of knowledge just as they are instructed in the knowledge itself. Since the basic science teachers, already pressed for time in the presentation of their courses, are unable to more than stimulate student thinking towards the practical application of knowledge, this instruction for pharmacy students must occur in their professional courses. The application of the basic sciences to the problems of the profession then becomes the real goal of pharmaceutical education.

The drug assay course, usually scheduled in the latter portion of the pharmacy curriculum, can serve not only to train students in the problems and operations involved in the analysis of pharmaceutical products, but also can serve to stimulate students to apply scientific principles to pharmaceutical problems. This bridging of academic disciplines, if attained, will no longer permit the student to regard sodium salicylate as a chemical formula in organic chemistry, a tablet in pharmacy, an antirheumatic in pharmacology, and as a profit in the community pharmacy.

If this correlation of disciplines is to be accomplished, drug assay, as well as the other professional courses, must be presented in such a manner as to require the student to utilize his knowledge of the basic sciences in the solving of pharmaceutical problems. An attempt to accomplish this in the drug assay course at the University of Illinois has resulted in presenting to the students a survey of functional group analysis which is illustrated with the official assays of the *United States Pharmacopoeia* or the *National Formulary*. Newer analytical techniques and the more important instrumental methods are included. This approach stresses broad chemical principles and general chemical reactions already presented to the student in his preprofessional or professional education, and these are now applied to pharmaceutical products. The student is challenged not only to learn something about existing assays, but is required to suggest assays for chemicals or pharmaceutical preparations not previously studied. In this way, he is forced to apply general scientific knowledge to practical problems and is brought to regard analytical chemistry as a vital and developing field requiring imagination and ingenuity.

If the course in quantitative analysis has dealt adequately with the determination of inorganic compounds, and if, as usual, time is an important factor in course content, it is logical to stress the analysis of organic compounds in drug assay. The official assays make excellent illustrations for the more common functional group methods. For example, while discussing the analysis of salts of carboxylic acids, the following assays may be used as examples of relatively general procedures:

*Presented to the Section of Teachers of Chemistry, AACP, Los Angeles, California, 1958.

1. Titration in the presence of an immiscible solvent—Assay of Sodium Salicylate.
2. Combustion Method—Assay of Sodium Potassium Tartrate.
3. Titration of acid formed by Ion-exchange Resin—Assay of Sodium Citrate Injection (1).
4. Determination of Cation—Assay of Aluminum Acetate Solution. Assay of Ammonium Acetate Solution.

The inclusion of the assay of sodium salicylate offers an opportunity to emphasize the difficulties that would be involved in the direct titration of an alkaline salt and also permits a review of the concept of the distribution of a compound between immiscible solvents. Ion-exchange resins are introduced not merely as analytical methods for determining salts of carboxylic acids, but are presented also as tools for analytical and chemical separations and as a means of purifying and softening water. These four methods present to the student a method for water-insoluble acids, a method for water-soluble acids, a more general method with certain limitations and a method applicable only when the cation may be removed from the solution. This forces a student to look critically at an assay and to utilize the physical and chemical properties of a compound in selecting the method most suitable for its analysis.

A study of the general methods for the determination of phenols offers an opportunity to discuss the relative acidities of phenols and other weakly acidic substances and make practical application of this information. Hexachlorophene may be studied as an example of a phenol acidic enough to be titrated in aqueous solution, while phenol itself being less acidic must be determined by bromination. The application of this bromination to other compounds can best be approached through a consideration of the electronic concepts of organic chemistry. A study of other compounds that might also brominate and thereby interfere with this determination places a practical value upon theoretical information. The cassia flask method for eugenol in clove oil serves to initiate a consideration of solubility-chemical structure relationships—a subject of practical value to the pharmacist. The determination of phenols by acetylation may be illustrated with the assay of diethylstilbestrol. This is a particularly fine sample, as the presence of the double bond creates a problem in the bromination method.

If the determination of alcohols follows the discussion of the determination of phenols, the assay of cetyl alcohol for its hydroxyl number and the assay of peppermint oil for total menthols are satisfactory examples of acetylations in which the excess acetic anhydride is measured or the acetylated compound is determined by hydrolysis. These, therefore, illustrate a reaction for which there exists more than one analytical method. While having no pharmaceutical applications at present, a discussion of the use of phthalic anhydride for the determination of alcohols in the presence of phenols introduces the student to the chemical approach to the analysis of mixtures.

Since alkaloidal assays are based upon the reactivity of the amino group, they can be considered as examples of the analytical determination of amines. Here the relative basicities of amines may be discussed, column chromatography introduced as a means of separating or purifying alkaloids, and the problems of extraction presented. Other analyses based upon extractive methods may be logically discussed at this time. The analysis of amines by diazotization may be illustrated by the official assays of the sulfonamides. The potentiometric end point as described by Rocca and Waters (2) for this assay presents an

opportunity to discuss electrometric titrations. The assays of succinylsulfathiazole and phthalylsulfathiazole where the basic amino group has been converted to a readily hydrolyzable amide group offer further application of basic organic chemistry to analytical procedure. The assay for oral arisulfapyrimidines suspension or tablets not only utilizes a reaction of the amino groups but illustrates the value of paper chromatography in the separation of mixtures. A departure from the use of the amino group for assaying the sulfa drugs is found in the analysis of sulfisoxazole by nonaqueous titration. The discussion of this procedure may be introduced under phenols, but is well considered here as the salts of a number of amines are analyzed in this way.

This approach to the teaching of drug assay means that such a topic as the assay of vegetable oils and fats will not be discussed as a separate topic; but the acid value, saponification value, and iodine number will be considered under the determination of carboxylic acids, esters, and unsaturation. While this was a departure from the usual approach, it serves to emphasize the chemistry involved in each of these determinations.

Colorimetry, spectrophotometry, other instrument methods, water determinations, and the use of physical constants can be introduced at convenient times during the course. Distributing these topics throughout the course offers variety to the student and sometimes assists in a better correlation of the laboratory and the lectures.

The presence, in the USP and NF, of a number of official assays based upon such elemental analyses as the Kjeldahl method for nitrogen and the various methods for halogen demand that elemental methods be considered at least briefly. This affords an opportunity to correlate the reactivity of the halogen atom with the method necessary for an accurate analysis and insures a review of the Volhard titration, the use of aqueous alkalie to remove the halogen of a reactive halide (assay of butyl chloride) and the Parr bomb method for unreactive halides. The assays of mild silver protein and thyroid may be introduced as variations of the usual type of elemental assay.

It should be kept in mind that if this method of presentation is to be fully effective, the assays must be presented as examples of general methods of assay and not as an assay which also happens to be a general method. The functional groups most likely to occur in pharmaceutical products may be stressed, but methods for which there are no USP or NF examples should not be ignored for these methods may soon become important by the introduction of a new drug.

This approach to drug assaying cannot be found in any existing textbook. The well-known book by Siggia (3) or the laboratory manual by Shriner (4) may be used as a text if the proper pharmaceutical applications are presented by the lecturer. A more practical plan is for the lecturer to supply the outline of the functional group analyses and to furnish the students with references to the existing book (5) on pharmaceutical analysis. A reading outline furnished the student at the beginning of the course will relieve the lecturer of the monotony of quoting page assignments.

A well-planned course in drug assay following this presentation should succeed in achieving the goals for the course as outlined by Blauch and Webster (6) and with an adequate course in quantitative analysis would fulfill the scope of analytical chemistry in the pharmaceutical curriculum as outlined by James (7). It should also develop in the student the proper scientific approach toward solving the problems occurring in the practice of his profession.

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(2) Rocca, J. P. and Waters, K. L., *J. Am. Pharm. Assoc.* (*Sci. Ed.*) 39, 521 (1950).

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To the drugstore come all the people of the neighborhood not only to purchase services and goods but also to meet their friends and neighbors, to carry on informal discussions, to follow the American way of life.

Walter D. Cocking, Am. J. Pharm. Ed., 4, 27 (1940)

PANEL: CURRICULUM AND SYLLABI FOR COURSES IN PHARMACY ADMINISTRATION--FIVE YEAR PROGRAM*

INTRODUCTION

ROBERT V. EVANSON, MODERATOR

For a number of years there has been some concern expressed for course titles, course content, course sequence, and the specific courses to be required and elective in the area of pharmacy administration. Desirous of bringing some concrete order to the scheme of instruction, Mr. Paul Pumpian, Chairman of the 1957 Meeting of this Teacher's Section, appointed a Committee to Study Curriculum and Syllabi—Five Year Program. The objective of this Committee was to analyze the area of pharmacy administration in the five year curriculum and attempt to suggest its scope in the expectation of future requirements in the extended program.

Each member was assigned a specific subject area in pharmacy administration and was asked to determine the basic information as to course names, hours, prerequisites, and catalog description. Then the members were asked to outline the suggested content for each course which they considered important. The outlines were organized as a single unit, and a copy of the completed work was sent to every school of pharmacy.

To complete this project by giving voice to the work, the officers, through the Program Chairman, R. George Kedersha, decided to organize the Committee into a panel for this meeting to discuss the reasons for the contents presented and including a review of the aims and objectives of the area of pharmacy administration. In this manner the Conference would be performing a useful function as a medium of expression on a pressing problem to stimulate thinking and attempt to offer some solution to the question of the part that pharmacy administration should or will have in the five year program of academic instruction.

The course outlines as presented are not meant to be absolute, dictatorial, or the work of experts. They are meant to serve as a starting point from which both experienced and inexperienced teachers can initiate new and evaluate existing courses and course content. Much time has been spent by the committee members with the sole objective of being helpful and not controversial. The members, Dr. Esther J. W. Hall, Dr. Joseph D. McEvilla, Dean Stephen Wilson, Mr. John A. Lynch, and Mr. Paul A. Pumpian, will present their views and outlines preceded by a discussion of the aims and objectives of pharmacy administration by Dr. Paul C. Olsen. The presentations will follow the order of the program which does not imply or suggest course sequence in the curriculum.

PHARMACY ADMINISTRATION CURRICULUM-- OVER-ALL AIMS AND OBJECTIVES

PAUL C. OLSEN

The over-all aims and objectives of a pharmacy administration curriculum seem to be inseparably tied up with considerations of a more general nature in the field of pharmaceutical education.

First, with the general start of the five year program close at hand there

*Presented to the Section of Teachers of Pharmacy Administration, AACP, Los Angeles, California, 1958.

is a widespread misunderstanding about it in business and in industry. This misunderstanding extends to pharmacy students and prospective students and even to faculty members. What isn't understood is resisted so there exists at this late date extensive opposition to the change.

Second, there is far from unanimous agreement in the various segments of the pharmaceutical profession that there is a shortage of pharmacists and thus a need for a recruitment campaign to enroll pharmacy students. In defense of this position, it is stated that what is needed is fewer and better drugstores.

There is support for this view. The fact is that one out of four self-employed pharmacists in this country at this moment have smaller incomes than they could obtain as employees in the numerous occupations for which pharmacists are qualified. They are the drugstore owners with establishments that have sales under $800 a week or $40,000 a year.

The number of pharmacists self-employed in this manner is decreasing. Sometimes there is, however, a trend in the opposite direction. That occurs when an ill-informed pharmacist in his anxiety to achieve self-employment quickly becomes the owner of one of these stores. Under our democratic way of life we can only inform and train. Certainly a program of speedy and wholesale displacement of self-employed pharmacists is foreign to us in this country.

Third, there is the belief that though a recruitment program for pharmacy students may be needed, it so far has been a failure. The evidence in support of this belief is the fact that undergraduate enrollments in colleges of pharmacy are lower now than when the recruitment campaign started. This conclusion overlooks several facts. One is the situation ably described by Dr. Stephen Wilson on numerous occasions. He points out the relation of the number of students in college now to birth rates in depression years. Then there is the lack of comparability of year-to-year figures on pharmacy student enrollments because of the change in many colleges from four year to longer programs.

Fourth, there is an attitude which can be described as condescending toward the retail drug trade among pharmacists who are not themselves in that branch of the profession. This attitude seems to be decidedly unrealistic and contrary to the needs and desires of pharmacists who are self-employed in drugstores. The unfriendly attitude of pharmacists outside the retail drug trade toward their brethren in drugstores is probably epitomized in the widely held belief that a drugstore devoted entirely to prescription filling is somehow a "better" drugstore than one which, in addition, has a number of other departments. As a matter of fact, there are other and much more reliable standards by which the quality of the professional service in a drugstore can be judged.

Fifth, it is needless to try to deny that in the retail drug trade itself there are both self-employed and employee pharmacists who regard their profession with deprecation if not downright contempt. To be sure, some are in the group previously noted who have had meagre financial success as drugstore owners. Others understandably look at pharmaceutical education today in terms of their own two year and three year courses. A number of pharmacists in active practice today are, in fact, products of the six week and three month schools. Some obtained their licenses on the basis of apprenticeship alone.

The first and most direct contact that present and prospective students have is with faculty members in colleges in which they have entered or propose to enroll.

For that reason, I cite a remark by a distinguished former president of the American Association of Colleges of Pharmacy and a former colleague, Dr. Linwood F. Tice. He is quoted as having said at a meeting this year of the National Drug Trade Conference that he is not interested in training undergraduate students in pharmacy to sell "toothpaste." Yet, as the viewpoint on this matter is stated by pharmacists in the retail drug trade, if there is one personal care item the retailing of which is most appropriately conducted in drugstores supervised by pharmacists, that item is dentifrices

The views of another distinguished editor and pharmaceutical educator, Dr. Melvin R. Gibson, are evidently similar. In the editorial columns of the *American Journal of Pharmaceutical Education*, the opinion has been stated that an undergraduate student in pharmacy somehow does better for himself and for his chosen profession by working in some place other than a drugstore. (*See Editor's Note following this article.*)

The purpose of this outline is of course to highlight and emphasize the background against which the pharmacy administration curriculum must proceed. The basic soundness of this program of teaching is abundantly demonstrated by the enthusiastic and indeed grateful manner in which it is being received.

It can't help but be that way. With upward of 90 per cent of the graduates in pharmacy finding employment opportunities in the retail drug trade and well over half of them seeking and obtaining self-employment in the retail drug trade we must point our over-all aims and objectives to the pharmacy graduates who will enter the retail drug trade.

Education in retailing and other business subjects at the collegiate level has a history as long and distinguished as pharmaceutical education. The pharmacy administration curriculum therefore has been recognized as an essential part of pharmacists' college training.

Thus they are provided with essential training both as retailers and as pharmacists.

To be sure, the needed retail training has been acquired oftentimes by apprenticeship and experience. The danger in such a practice can be highlighted perhaps by considering the preposterous situation of the product of an undergraduate or graduate school of retailing becoming a self-taught pharmacist by apprenticeship and experience.

The over-all aims and objectives of a pharmacy administration curriculum therefore are to integrate training as a retailer with that as a pharmacist.

To this end we must avoid the false lure of vocational training. We must instead provide teaching materials that are as stimulating and thought-provoking as any available in either the physical sciences or the humanities. In that way pharmacy graduates will have as complete a knowledge of retailing essentials in the drug trade as can be imparted in the classroom and laboratory and by field trips.

And—perhaps of even greater importance—they will have a full understanding of the relation of this training in retailing to their training in pharmacy.

Editor's Note: The following correspondence regarding the erroneous reference to my views is included here to correct a public statement made by Dr. Olsen. Subsequent to my letter of July 17, I received no correction or apology from Dr. Olsen. He was sent galley proof, and no correction was made in the galley proof.

June 13, 1958

Dear Dr. Olsen:

I have received recently from Professor Kedersha your paper "Pharmacy Administration Curriculum — Over-all Aims and Objectives" which you presented to the Section of Teachers of Pharmacy Administration in Los Angeles. On page 3, and in paragraph 3 you state that I "in the editorial columns of the *American Journal of Pharmaceutical Education*" have expressed "the opinion . . . that an undergraduate student in pharmacy somehow does better for himself and for his chosen profession by working in someplace other than a drugstore." This sentiment is completely foreign to my views. I would be interested in your quoting where in my editorial columns you found such an expression of opinion. I shall look forward to your reply.

Sincerely,
Melvin R. Gibson

June 18, 1958

Dear Dr. Gibson:

The reference about which you inquired June 13 is the editorial on pages 158 and 159 of the American Journal of Pharmaceutical Education, Spring, 1957.

Yours sincerely,
Paul C. Olsen

July 8, 1958

Dear Dr. Olsen:

Your letter of June 18, 1958 was waiting for me when I returned from a brief vacation. I suggest you read again the editorial to which you give reference. In your paper presented at Los Angeles you state that I said "an undergraduate student in pharmacy somehow does better for himself and for his chosen profession by working someplace other than a drugstore." The editorial to which you refer says nothing about an undergraduate student working in a drugstore. The editorial deals wholly with pharmacy faculty members working in stores.

Sincerely,
Melvin R. Gibson

July 17, 1958

Dear Dr. Olsen:

The paper which you presented in Los Angeles, "Pharmacy Administration—Over-all Aims and Objectives," will be published in the Fall, 1958 issue of the *Journal* providing you agree that the third paragraph on page three of the manuscript, which makes an erroneous reference to one of my editorials, should be deleted. You will receive galley proof in late September or early October.

Sincerely,
Melvin R. Gibson

A METHOD OF ACHIEVING THE OBJECTIVES OF ACCOUNTING IN THE PHARMACY CURRICULUM

JOSEPH D. McEVILLA

The course in accounting concepts as presented to students in the schools and colleges of pharmacy has in most cases been preceded by a course in general economic principles. This has given the student a knowledge of the economic

world in which he lives. In addition, he has pursued courses in the natural and physical sciences. These have given him a knowledge of the basic sciences contained in the education of a pharmacist. In the third year of his educational experience, he should receive an appreciation of the business as well as the professional aspects of retail pharmacy.

There are many objectives in teaching accounting to pharmacy students, but it is certain that one of them is not to train them to be accountants. Such an objective would contain the same futility as though the school of business were to attempt to train their students to be pharmacists in a single semester course. I feel the objectives of such a course are: (1) to give the student an understanding of the accounting process as conceived of as a systematic series of actions directed toward a particular end; (2) to give the student a basic understanding of what accounting records and reports can do toward making the retail pharmacy a more efficient profit-making machine; (3) to train the student in the use of accounting records as a basis for managerial decisions.

If these are the objectives of teaching accounting to pharmacy students, the problem becomes one of how to accomplish such objectives. This may be subdivided into several smaller problems, and thus reduced to its most simple form. When each of the subproblems has been solved, the process of aggregation may be employed to arrive at the solution to the main problem.

The subproblems become: (1) When should such a course be taught? (2) How long will it take to present the material necessary for the objectives to be obtained? (3) By what methods of instruction can the objectives best be achieved? (4) What material should be taught in such a course? (5) What obstacles are likely to be encountered in the solution of these individual problems?

Let us examine these problems in their respective order. The first problem is that of determining where in the curriculum should such a course be presented. This requires an investigation into two areas. First, what educational experiences should the student have had prior to pursuing such a course? Second, what part of the foundation or superstructure is accounting in the sequence of pharmacy administration courses?

The educational experiences to which the student should have been exposed are those which would give him a knowledge of the economic world in which he lives and a knowledge of the specific institution in which he expects to earn his living. The former can best be achieved by a formal course in economic principles and policies and possibly additional knowledge in the action of the individual or the group. It is desirable for the student to have had some association with a retail pharmacy. If the student has had this latter experience, he will have been a part of the organism under study.

The second part of the first question is concerned with the position of accounting in the sequence of pharmacy administration courses. Accounting is basic to the understanding of the business process. Since one of the objectives of the course is to train the student in the use of accounting records as a basis for managerial decisions, it is necessary that his knowledge of accounting records precede the course in management.

The teaching of accounting concepts, with adaptations directed toward transaction experiences encountered in retail pharmacy, can best be done by a member of the pharmacy administration department. This would place the accounting course within the boundaries of the professional curriculum. Since accounting is generally recognized as basic to the other courses in the sequence, it should

be offered in the fifth or sixth semester of a ten semester curriculum or in the seventh or eighth semester of a twelve semester curriculum.

The second problem, that of the time required to achieve the stated objectives, now requires examination. The conventional three-credit course involves forty-five hours of instruction. The way most accounting courses are currently taught in schools and colleges of pharmacy involves thirty hours of didactic instruction plus thirty hours of laboratory instruction—a total of sixty hours.

This is the minimum allotment of time necessary to achieve the objectives of teaching accounting to pharmacy students. The time limitation is the weak point in teaching the management approach to accounting in a three-credit one semester course. The student must have a basic understanding of accounting principles prior to attempting its use as a tool of analysis. In the past it has required a full semester's work to acquaint the student with the most basic principles of accounting. Now if the basic principles are to be telescoped into a shorter period in order to introduce the student to the principles of analysis, this will impose a hardship not only upon the student but upon the instructor as well. The time devoted to any one basic point must of necessity be limited. Therefore the student will be required to devote considerable time outside the classroom in the pursuit of accounting knowledge. The first alternative to such a dilemma is to reduce the course content. The second alternative would be to maintain the course content but expand the number of hours of instruction. If the choice is the first alternative, the reduction in course content could perhaps best be achieved by removing sections H. and I. from the course outline. This should not lead the casual observer to conclude that these two sections are of no importance in achieving the original objectives. Since these sections are concerned primarily with the accounting approach to valuation and income determination, they may have had some coverage in the economic principles and policies course. For this reason their deletion may be in keeping with the objectives, and if such is the case it may be presumed that the student could review and acquire sufficient recall to permit a condensation of the total content of these sections. On the other hand, if the choice is to expand the allotted time and thus include the total content of the course outline, it would be desirable to devote more time to the basic principles than to attempt any expansion of the course content.

The instructional process by which accounting can best be presented to pharmacy students has, I believe, been agreed upon. The use of two lectures and one two-hour laboratory a week has had general acceptance in schools and colleges of pharmacy. This is the case in spite of the fact that most collegiate schools of business do not make use of a laboratory as an instructional tool in teaching accounting. The laboratory work should be designed to supplement the lecture material in the first half of the course. In this way instructional methods of mechanical manipulation can be carried out in the laboratory, leaving the lecture time free for the theoretical presentation of the principles involved. As the course progresses and the student acquires proficiency in the mechanical manipulation of accounts, the laboratory may be used to complement the lecture material. The complementary function can be carried out by the use of case material suitable for analysis using the principles of accounting. In a manner similar to that described above, the laboratory material may be expanded or contracted as would be necessary to conform to the allotted time.

The question of what material should be taught in such a course will of necessity vary with the individual presenting it. His background, education,

and experience with the operation of a retail pharmacy will temper his selection of course material. However, the above variables will have little effect on the generally accepted concept of including the basic principles and preparation of formal statements as part of the course content.

I believe some time devoted to "The Nature of Business Capital" and "The Nature of Business Earnings" is desirable. This will give the student an understanding of capital, its power, its sources, and its preference in liquid form. It will give the student an understanding of earnings and their sources, costs and their bases, as well as the effect of price variations and their effect on financial management.

Payroll accounting is a very essential part of retail pharmacy operation. Yet, this aspect is seldom contained in the standard course content of the first year of accounting. It is of vital importance that the manager of a retail pharmacy has an understanding of payroll accounting with its manifold ramifications. Only in this way can he be prepared to satisfy the various federal and state regulations pertaining to the paying of employees.

The retail pharmacy is going through a period of change unequalled in its many years of existence. The retail function is increasing in size and consequently in its complexity. Departments are being added, and departments are being considered for possible elimination. For this reason departmental accounting should occupy a section of the course content. In this way the student can learn the problems as well as the advantages of departmentalization. A knowledge of departmental accounting will enable the future manager to determine the contribution of each department to the store. It will further enable him to determine the direct and fixed costs applicable to each department. In this way departmental expenses are made known and once known are under the control of the manager.

The analysis of financial statements, from which managerial decisions can be made, is a very important part of the course content. It is from the analysis of financial statements that decisions concerning the future of the store should be made. For this reason it is essential that the student be familiar with the various types of analyses, interpretation, and the content of the financial statements. The manager of a store should be familiar enough with these statements to prepare them himself or be able to understand those prepared for him.

The final question concerns the problems which may be encountered in the solution of any of the above individual problems. The problem confronting the position of the course in the sequence seems to be nonexistent in the minds of those of us in pharmacy administration. There seems to be agreement that it belongs prior to such courses as pharmacy law, marketing, and management. Therefore, the first professional year becomes the logical position for the accounting course. The second question involving one of time is perhaps where the biggest problem lies. A minimum of sixty hours of instruction is required. This would limit it to a one semester course. In view of the possible elective courses in economics suggested by Dean Wilson, and recognizing the value such courses would be to the student and the limitations of time in any curriculum, I feel that adequate instruction can be carried out within the suggested time period. The problem of instructional methods gives rise to the rationale behind the use of a laboratory. The practicality of a laboratory in the accounting course was raised by Dr. Ashburne at the seminar in Texas. The question at that time was how to prevent the better student from wasting his time. The

elementary manipulations designed to keep the average student busy are carried out by the better student in a short period of time and then he goes on his way. If laboratory assignments are known beforehand, he may even come to the laboratory with the work completed. This is a problem which must be faced where a laboratory is used, and the equipment necessary to carry out the functions performed in the laboratory is available to the student in the comfort of his own room. The use of the laboratory seems reasonable when considered in two lines of reasoning: (1) A student who is required to attend a laboratory session will at least start his assignment under supervision and may ask questions on points which were not clear to him in lecture; (2) By using a laboratory, an additional fifteen hours of instructional time is obtained. This latter point may raise the question of subterfuge. However, in this case, the end may justify the means.

The problems involved in establishing course content center around what should be included and what can be eliminated. In a three-credit course of one semester duration there would seem to be little use in trying to incorporate any type of manufacturing or corporation accounting. Since the great majority of pharmacies in the United States are either of the sole proprietorship or partnership type of legal organization, emphasis should be placed on the accounting aspects of a trading business representing this type of structure.

We may now use the aggregation process to answer the question of how the objectives of teaching accounting to pharmacy students are to be achieved.

The course in accounting, which in many cases is the first course in the pharmacy administration sequence, should be taught in the first professional year of a five year curriculum or the third academic year. It may be taught in either the fifth or sixth semester but in any case should precede the courses in marketing, law, and management. It will require a minimum of sixty hours to accomplish the aims and purposes of such a course. However, where time permits, an additional thirty to forty-five hours of instruction would not seem unduly extended. The course content should include the basic principles of accounting with emphasis on the single proprietorship and partnership type of legal organization. It should also include the principles of statement analysis, payroll accounting, departmental accounting, and, where possible, valuation and income determination. It is necessary that the student learn the rudiments of account manipulation and transaction analysis. The instructional method employed to achieve the desired educational level is the lecture and laboratory method. The laboratory may be used both to supplement and to complement the lecture material, providing the student with the opportunity to learn the techniques of bookkeeping and the art of statement analysis through the use of case studies directed toward financial accounting.

It is by these methods and course content, as presented in the outline in your hands, that I feel the stated objectives of teaching accounting to pharmacy students can be achieved.

Report on Accounting

by Joseph D. McEvilla

Accounting for Retail Pharmacy Management (required)

Prerequisites should include Principles of Economics (one year); Mathematics (one year); English (one year).

Other courses which might have value as background courses include Business Law and Philosophy.

This should be a one-semester course in the third year — semester six — and taught in two lectures and one two-hour laboratory period for three (3) credits.

The course should be taught by the professor of pharmacy administration.

The course should be developed with very few to some case studies.

Catalog Description: A study of the managerial aspects of accounting, designed to provide information as to the sources and means of accumulating accounting data and to promote a clear understanding of the nature of business operations and of the potentialities and limitations of accounting.

Course Content:

A. Underlying Concepts
   1. Accounting defined
   2. Objectives of accounting
   3. Emphasis on private business organized for profit
   4. Services of accounting to management, employees, owners, creditors, public
   5. The nature of business
   6. The repetitive nature of business operations
   7. The role of credit
   8. Business capital and business assets
   9. Sources of business capital
   10. Relationship between business capital and its sources; the accounting equation

B. Formal Accounting Statements
   1. The balance sheet
      a. Purpose
      b. Construction
      c. Form
   2. The statement of income and expense
      a. Purpose
      b. Construction
      c. Form

C. Business Transaction Analysis
   1. Importance of correct analysis
   2. Analysis equations
   3. Debit and credit
   4. Changes in real and nominal accounts
   5. The accounting period and its relation to income and expense transactions
   6. Discounts: cash and trade
   7. Returns and allowances
   8. Losses on uncollectable accounts
   9. Notes and interest

D. Classification of Accounting Data
   1. Accounts
   2. Ledgers
   3. Special ledgers
   4. Relationship between special ledgers and the general ledger
   5. Controlling accounts
   6. Trial balance
   7. Results of operation

E. Accumulation of Accounting Data
   1. General journal
   2. Sales journal
   3. Cash receipts journal
   4. Cash disbursement journal

F. Preparation for Financial Reporting
   1. Frequency of financial reporting
   2. Sources of financial reporting
   3. Recognition of unrecorded income
   4. Recognition of unrecorded expense
   5. Inventory valuation
   6. Adjusting entries
   7. Working papers
   8. Closing entries

G. Accounting Reports
   1. Types of accounting reports
   2. Purpose of accounting reports
   3. The financial statements
   4. The income and expense statement
   5. The balance sheet

H. The Nature of Business Capital
   1. Earning power of capital
   2. Liquidity preference of capital
   3. Asset groupings
   4. Tangibility of capital
   5. Reasons for borrowing
   6. Relationship of capital to its sources
   7. Earnings as a source of capital
   8. The accounting concept of value
   9. Determination of capital
   10. Bases for asset valuation
   11. Contrast of liabilities and net worth

I. The Nature of Business Earnings
   1. Earnings and asset valuation
   2. The arbitrary accounting period
   3. Problems of cost incidence
   4. Costs of determinate benefit
   5. Joint costs
   6. Fixed costs
   7. Changing price levels and financial management
   8. Control of earnings

J. Payroll Accounting
   1. Federal income tax withholding
   2. Social security legislation
   3. Federal old age benefits
   4. Federal unemployment tax
   5. State unemployment tax
   6. Unemployment benefits
   7. Employee compensation records
   8. Statements to employees for wages paid and tax deductions

9. Federal fair labor standards act
10. Employees and employers affected
11. Record requirements under the wage and hour law
12. Workman's compensation insurance
13. Tax payment
14. Employee statements
15. Sources of funds
16. State labor acts
17. What is employment?

K. Financial Statements
1. Major aim of accounting
2. Functions of financial statements
3. Content and form of balance sheet
4. Interpretation of balance sheet
5. Percentage analysis of balance sheet
6. Content and form of income and expense statement
7. Interpretation of income and expense statement
8. Percentage analysis of income and expense statement
9. Balance sheet and income and expense statement ratios
10. Comparative analysis of balance sheet
11. Current period and total-for-the-year analysis of income and expense statement
12. Comparative analysis of income and expense statement
13. Statistical data and published reference standards

L. Departmental Accounting
1. Departmental accounting systems
2. Changes required in ledger accounts
3. Departmental work papers
4. Departmental income and expense statement
5. Departmental balance sheet
6. Direct and indirect expenses
7. Apportioning indirect expenses
8. Advantages of departmental accounting

M. Summary of Accounting
1. Dual objective of accounting
2. Accounting valuation estimates
3. Dual aspects of accounting
4. Valuation objective
5. Control objective

N. Laboratory

The laboratory material would serve both a supplementary and a complementary function. In the early stages of the course the supplementary function would predominate. In this stage the mechanical processes of bookkeeping would be emphasized. The student would be required to prepare accounts, work problems, and analyze business transactions. The complementary function would become predominate in the second half of the course. In this part of the laboratory course the student would be required to analyze financial statements and derive answers to case studies having a financial base.

PRINCIPLES OF ECONOMICS IN THE FIVE YEAR PROGRAM

STEPHEN WILSON

In the report of the Curriculum Committee for Pharmacy Administration in the five year curriculum, it is recommended that in the area of economics the basic six-credit course in principles be required. This should be taken during the prepharmacy preparation if possible. This is a basic course and should be prerequisite to all other courses in economics, and, in fact, to all other courses in pharmacy administration.

It is also recommended that the courses in economics of consumption and social security be considered as electives. Another elective course which could be well recommended is the one in money and banking. These recommendations are based upon the feeling that the five year course in pharmacy should be restricted to basic and fundamental courses which will provide a solid foundation on which the student may build firmly as time goes on. For this reason the course in principles of economics is listed as a required course, and the other courses in economics are all indicated as electives. While the advanced courses in economics would be beneficial and are important, the student may, perhaps, utilize such courses as principles of sociology to better advantage than additional work in economics which could come later, and perhaps should come later, even after graduation.

The five year course in pharmacy follows the precedent which has been set

in medicine, dentistry, and other health professions. On the other hand, as the amount of knowledge continues to increase, it will not be possible to require the mastery of all of it by adding year after year to the curriculum. The alternative approach of narrowing fields of specialization more and more is likewise unacceptable to educators generally and to the public good. The alternative which appears to be more acceptable is to use the undergraduate curriculum, be it four, five, or six years, for the establishment of a firm foundation of a basic knowledge that the student can then supplement, not only by electives while he is in school, but by adult education courses taken during his lifetime.

Another course which might be suggested as an elective, and some may even feel it should be required, is a course which is perhaps not currently given anywhere as a separate course. This course would be called by some such title as "health economics," "economics for the health professions," or something similar, and would present the public point of view on health matters, such problems as health insurance, and topics of current interest which would change with the times. Such a course would also have the ultimate effect of preventing such issues as socialized medicine from arising, or at any rate, from developing to the state where they would be considered as precipitate issues.

Report on Economics

by Stephen Wilson

Principles of Economics (required)

No prerequisites. This is the basic course.

No comment as to courses of value as background. (a) Six credits, (b) Second year; Semesters three and four, (c) Three lectures per week.

This course should be taught by the staff of the Department of Economics.

This course should be developed with some to many case studies, depending on the ability of the teacher to use them effectively.

Catalog Description: This course is designed in most schools to let students know what Economics is and what Economists do, and to give them some basic information about how to look at economic problems and analyze economic issues. While emphasis is placed on the economic process, the students also gain some familiarity with how economic institutions operate (firms, banks, governments, etc.) and with some basic economic concepts (profits, productivity, inflation, etc.).

Course Content: The course begins with a look at the basic economic problem of allocating limited resources among alternative uses for the ultimate purpose of satisfying consumer wants, and at how the "circular flow" of economic activity determines the nature of production and the distribution of income through the operation of resource and product markets. It then examines "demand and supply" and the determination of market price under competitive conditions, followed by a look at "imperfect" or "monopolistic" markets. Attention is then given to the economic role of government as a taxer and borrower and as a provider of services, as well as the over-all economic impact of government activity. Money, credit, and banking come next: what is money, what determines the value of money, how do our banking institutions function, what is the role of the Federal Reserve System. An objective look is also taken at the aggregate operation of the economy and the causes of economic fluctuations, including measures to promote high employment and to resist depressions.

Finally, the course usually makes a direct examination of some major current problems: business competition and public policy; labor supply and organization and public policy; agricultural problems and public policy; international trade and public policy; etc.

Consumer Economics (elective)

Principles of Economics is a basic requirement.

No comment as to other courses of value as background. (a) Three credits, (b) Any semester of, after second year, (c) Three lectures per week.

This course should be taught by the staff of the Department of Economics.

This course should be developed with some to many case studies, depending on the ability of the teacher to use case studies effectively.

Catalog Description: Economic analysis and problems from the vantage point (but not necessarily the point of view) of the consumer.

Course Content: As offered in most schools, major topics have been as follows: consumption and income; production and consumption; consumption and welfare; wants, utilities, and consumers' choices; variations in consumption: style and fashion; critique of current practices in consumption; legislation affecting consumption; the state and consumption; the cost of living; living standards and family budgets; the impact of marketing, advertising, and salesmanship on consumption; consumer credit and cooperation.

Social Security (elective)

Principles of Economics is a basic requirement.

No comment as to other courses of value as background. (a) Three credits, (b) Any semester after second year, (c) Three lectures per week.

This course should be taught by the staff of the Department of Economics.

This course should be developed with some to many case studies, depending on the ability of the teacher to use case studies effectively.

Catalog Description: This course considers the major problems faced by individuals in relation to their capacity for self-support in our kind of society: old age, disability, unemployment.

Course Content: As usually offered, the course undertakes to examine the present public income maintenance and related programs for dealing with these problems (Workmen's Compensation, Old-Age and Survivors Insurance, Unemployment Compensation, Public Welfare, etc.) as well as alternative approaches (for example, collectively bargained pensions, group insurance, etc.; private savings and private charity; etc.). Emphasis is placed on the major policy issues and on the economic consequences of public and private security plans. A look at relevant experience in other countries is usually included.

Added Remarks: This course suggests the possibility of another which I do not believe is offered anywhere as yet. What I have in mind is a course which would be titled "Health Economics" or possibly "Medical Economics," and should, I think, be of interest to students in all of the health professions either at the professional level or possibly, better yet, at the pre-professional level. It would be similar to the course outlined above, except that it would be restricted to health matters. It would include the problems of the costs of medical care, insurance, and so forth. It would have the effect of keeping the health professions aware of the public aspects of their callings, and should, over a period of time, have the effect of obviating such things as socialized medicine reaching the status of a precipitate crisis.

MANAGEMENT

ESTHER J. W. HALL

The unique specialization of a pharmacy school with its obligation to more than 75 per cent of the graduates who enter retailing places the pharmacy management syllabus in a different class from a regular business administration approach to management.

The numerous interrelationships of professional ethics, pharmacy laws, distinctive fiscal ratios, and the usual principles of business warrant the use of more hours for pharmacy administration courses than have heretofore been given these subjects.

The teachers in a business school whose diversified offerings encompass all levels of business from department stores to railroad management may have a restrictive view of pharmacy school offerings.

Pharmacy management as a course suffers in the area of semantics: Are we concerned primarily with a course in basic management or an over-all course in retailing? Do we plan for management to serve as a base for such courses as hospital pharmacy or industrial pharmacy?

How do we define management? Should it be considered as: "detailed consideration of organization policies, procedures, costs and efficiency in retail

pharmacy" or is it better defined as: "organizing, planning, controlling a business or other organization of people and functions?"

Do the curricula experts prefer a survey course directed to students admittedly by curriculum, deficient in basic prerequisites required by accredited colleges of business administration? Should we separate managerial functions from promotional functions? Is the approach directed toward top-level management, or are we concerned primarily with small business operation?

The extension and presentation of topics in management depends in a large measure on the hours allotted. To quote some teachers as well as deans now associated with pharmacy administration:

> Our group should be cautioned on the total number of hours planned to devote to pharmacy administration. We should be careful not to cram too many hours into the curriculum.

It is highly desirable to expand the base for management, but to do so at the sacrifice of courses in accounting, business law, or by asking for twenty-one semester hours, is open to careful study.

Salesmanship, business writing, public speaking, statistics, finance, advertising, and many other subjects might be considered as prerequisites to good store operation, but where in curriculum building do we draw the line? Can we cover the pharmacy administration needed in eighteen, or even in twenty-one, hours? Were we ever expected to explore the entire business administration curriculum in the area of pharmacy business administration?

Report on Management

by Esther J. W. Hall

Pharmacy Management (required)

Prerequisites should include Economics and Accounting.

Other courses which might have value as background courses include Drug Marketing, Merchandising, Business Law, and Pharmaceutical Law.

This should be a one-semester course in the fifth year — semester ten — for three (3) credits, three lectures per week for one semester.

This course should be taught by the professor of pharmacy administration within the college or school of pharmacy, wherever possible.

The course should be developed with some case studies.

Catalog Description: Detailed consideration of organizations, policies, procedures, costs, and efficiency in the retail pharmacy.

Course Content:

A. Introductory Considerations
   (1 class hour)
   1. Organization and requirements in course
   2. Challenging problems for today's pharmacists

B. The Pharmacy and the Marketing Process
   (2 class hours)
   1. Nature of the retailing task
   2. Why retailing costs remain high
   3. Retail mortality, causes and remedies
   4. The general marketing background
   5. Basic phases of the marketing process
   6. The primary marketing functions
   7. Classification of goods
   8. Buying motives of the customers
   9. Marketing by manufacturers
   10. The nature and functions of middlemen
   11. Marketing channels
   12. The future in marketing
   (NOTE: If Marketing is offered, items 4-12 are not needed here)

C. Getting Started in the Pharmacy Business
   (3 class hours)
   1. Factors underlying choice of a community in which to locate a retail pharmacy
   2. Types of sites for a pharmacy and factors affecting a choice of site
   3. Proprietorship and organization
   4. Considerations in financing the new pharmacy
   5. Types of and amounts of capital; Planning the capital needed; Finance management
   6. Naming the pharmacy

D. Physical Facilities for a Retail Pharmacy
(4 class hours)
1. Acquiring premises for the pharmacy
   a. Advantages of buying vs. leasing a building
   b. Cautions in connection with the lease
2. Layout of the pharmacy
   a. The store front and entrance
   b. Factors governing internal physical layout
   c. Self-service store layout
3. Fixtures, equipment and modernization
   a. Functions of store fixtures
   b. Factors influencing choice of fixtures and equipment
   c. Factors influencing arrangement of store fixtures
   d. Financial and legal considerations in purchasing store fixtures
   e. Floors
   f. Lighting and decoration
   g. Air conditioning and heating
   h. Store modernization
4. Purchasing a pharmacy
   a. Cautions relating to purchasing a business
   b. Valuations of specific assets
   c. Valuation of intangible assets
   d. Check list of factors to be investigated
   e. Over-all appraisal

E. Purchasing and Control of Merchandise
(4 class hours)
1. Agencies and sources of supply
2. Choice of suppliers: their obligagations
3. Sources of assistance in merchandising
4. Knowing what and how much to buy
5. Methods of ordering
6. The pharmacist's purchasing policies
7. Goals and savings in purchasing
   a. Stock turnover and its advantages
   b. Causes and remedies for slow turnover
   c. Stock-to-sales ratio, model stocks
   d. Buying terms and discounts
   e. Protection of the pharmacist's credit
   f. Allowance and special deals
8. Receiving and marking; control of stock
   a. Receiving, marking and coding of stock
   b. Care of stock and inventories; slow moving stock
   c. Consignment and agency goods
   d. Leased department's own stocks
   e. Purchasing control plans

F. Pricing to Yield a Profit
(3 class hours)
1. Factors which control a pricing decision
2. General price policy
3. Price lining
4. Markup, margin and cost
5. Methods of calculating selling price
6. Handling expense, shortage and shrinkage
7. Averaging or manipulating markup
8. Minimum resale price maintenance laws and unfair trade practice laws
9. Policies concerning markdowns

G. Personnel in the Pharmacy
(2 class hours)
1. Personnel in relation to store layout
2. Technical procedures and devices
   a. Job analysis and job specification
   b. Application blanks and interviews
   c. Reference and tests
   d. Training
   e. Compensation methods and policies
   f. Incentives
   g. Communication
   h. Employee relations
3. Clerk personnel vs. professional personnel

H. Risk and Insurance for the Pharmacist
1. Types and basic causes of uncertainty
2. Methods of dealing with uncertainties and risks
3. The principle of insurance and marketing costs
4. Legislation and government regulation
5. Specific insurance coverage for a pharmacy
   a. Types of underwriting agencies
   b. Typical risks and coverage
   c. The factor of control

I. Competition for the Pharmacist
1. Classification of the competitive types
   a. Merchants in other lines
   b. Professional and economic dispensing
   c. Self medication
   d. Health service plans
   e. Internal store competition; brands, promotional appeals
   f. Types and degrees of service

J. Personal Salesmanship and Sales Promotion
(4 class hours)
1. Purchasing appeals to consumers
2. Study of consumer types
3. Steps in the selling process
4. Meeting customers' objections and excuses
5. Substitute selling and "switching"

6. Suggestion salesmanship
7. Store services
8. Sales promotion in the pharmacy
   a. Promotional policies
   b. Factors limiting any promotion
   c. Planning of advertising outlays and special sales
   d. Promotional media available
   e. Manufacturers' and wholesalers' part in sales promotion
   f. Aid from trade journals and advertising media
9. Display as a promotional medium for the pharmacist
   a. Purposes and effectiveness of display
   b. Factors influencing the type of display
   c. The pharmacist's display policies
   d. Suggestions in the use and construction of displays
10. Advertising as a promotional medium
    a. Purposes and policies in its use
    b. Advertising themes
    c. Psychological functions of an advertisement
    d. Advertising layout
    e. Suggestions for writing the advertisement
    f. Direct-mail advertising
    g. Radio and television advertising
11. Promoting professional business (2 class hours)
    a. Appearance and equipment
    b. Professional promotion
       1. To other professional men — suggestions
       2. To customers and the general public — suggestions
       3. Detailing professional men
       4. The consumer interest
12. Operating costs in the pharmacy
    a. Cost and quantity standards
    b. Sources of information on comparison data
    c. Implicit and imputed expenses
    d. Control over merchandise costs
    e. Stock turnover and margins in relation to sales volume
    f. Control of expense
    g. Planning and control records

K. Budgeting and Stock Control (2 class hours)
   1. Factors to consider when planning sales
      a. Stocks and stock turnover
      b. Initial markup
      c. Allowance for markdowns and shortages
   2. Planned purchases
   3. Budgeting for expenses
   4. Budgeting financial requirements and scheduling of expected income
   5. Stock control types and methods

L. Business Relationships and Public Relations for the Pharmacy (2 class hours)
   1. Agency stores
   2. Wholesaler sponsored chains and private brands
   3. Public relations for the pharmacist

M. General Business Policies (2 class hours)
   1. Areas for policy formulation
   2. Service policies
   3. Credit policy and procedures
   4. Policies concerning "free services"
   5. Policies concerning store hours
   6. Policies on complaints and adjustments
   7. Coordination of policy

N. Term Reports, current audio-visual aids, speakers, and field trips, attendance at institutes, conferences, and seminars, along with library research are supplementary to this syllabus

Personal Remarks: Some topics touched upon in this outline would logically fall into "merchandising"; but inasmuch as "merchandising" as a topic has not received universal acceptance, these topics are included in this outline.

In the event a five year program included a course in merchandising, this outline must be extended to include other topics which have been omitted due to time limitations within a three-semester-hour course.

In some instances a class-hour evaluation has been given, in others it has been omitted. The time depends upon the instructor and the class.

Addendum: (Chairman's Note: Prof. Hall included a list of objectives for the Management course in their proper place; that is, at the beginning of the course content. However, since no other outline included such a listing, the objectives are added here in order to follow the same format throughout the total report.)

Objectives:

1. To familiarize the students with the contents of one standard textbook in retail pharmacy management.
2. To acquaint them with the merchandising calculations most frequently needed in the administration of this planning, buying, pricing, selling, and calculations of operating efficiency.
3. To relate retail pharmacy operation to the broader field of marketing in which it is an important terminal element and within which it must function.
4. To assist students toward identifying and evaluating current trends and problems in business as they may affect retail pharmacy:
   a. Through presentation of speakers from manufacturing and distributive organizations supplying the drug trade.

b. Through reference to current business and economic studies, the current trade and professional press, and new books.
c. Through alerting students to watch for and report developments noted in their own casual reading.

5. To assign to students field projects in which they will be required to study and plan solutions for such problems as store location, internal store layout, setting up merchandising plans and budgets, collecting and appraising pharmacy advertising and display.

MANAGEMENT AND MERCHANDISING

ROBERT V. EVANSON

One of the most difficult tasks in the teaching of management as an applied area of pharmacy administration is a definition of subject matter which should be taught. Is management, or drugstore management as the usual title indicates, a course in management principles and practices, a general course in retailing, or an applied course which takes from both of these as needed to meet the objectives of the pharmacy curriculum?

The general tendency to date has been to adopt the philosophy that the management course should be a three-hour survey of the principles and practices of management, merchandising, and in some cases accounting and marketing. For this reason it becomes necessary to make certain assumptions before attempting to plan for the future of pharmacy administration in the extended program. The first assumption is that accounting is a separate subject and at a minimum should be a standard three-hour course which offers a background for management training and is more than simplified bookkeeping covering a series of repetitive entries for a given period of months.

A second assumption is that for pharmacy purposes marketing should be a separate course dealing with distribution processes and problems from the manufacturing level to the retail level and including the role of the consumer in these processes and problems. The third assumption is that the remaining subject matter—retailing—is too comprehensive to be dealt with in one semester in a manner suitable to the needs of pharmacy students who must leave college and assume positions of management as soon as possible in retail pharmacies. This is not the case for business school students who leave college with a general business background and enter all types and descriptions of business ventures where they will serve as trainees to learn the specific nature of their duties.

The pharmacy student needs first a basic understanding of a specific business —the retail pharmacy. However, because the horizons of pharmacy are increasing beyond the retail level even with the undergraduate degree, the student should have a basic understanding of the principles and practices of management which can be readily applied in other non-retail vocations. This understanding of management will also serve as background for his required internship training in a retail pharmacy.

In addition to management skills, pharmacy students who intend to enter professional practice should have more than a cursory survey of the techniques and problems of retail merchandising usually described as advertising, salesmanship and selling, sales promotion in general, and the concepts—economic and otherwise—of competition in retail pharmacy. Therefore, a six-hour sequence of management and merchandising is offered as a part of the report and this discussion. Because the term "merchandising" is not accepted by all schools in the professional curriculum, this same sequence may be cataloged as two semesters of drugstore management, if necessary, and still be taught as presented.

Report on Management

by Robert V. Evanson

Management (required)

Prerequisites should include Principles of Economics, Accounting, and Jurisprudence for at least three (3) credit hours each.

Other courses which would have values as background courses include Business Law, Economics of Consumption, Psychology, Sociology, Government and Business, Money and Banking, and courses such as Introduction to Business and/or Management.

This should be a one-semester course in the fourth year — semester 8 — and taught in the form of three lecture periods or two lecture and one recitation periods, for a minimum of three (3) credits.

The course should be taught by the professor of pharmacy administration.

The course should be developed with as many cases as will balance theory and practice to the ability of the instructor.

Catalog Description: Retail store management, including location, layout, organization, policies, buying and stock control, pricing, credit, and accounting.

Course Content:

A. What is Management?
   1. Definition and its implications
   2. Functions of management
      a. Planning
      b. Organizing
      c. Actuating
      d. Controlling
   3. Other management considerations
      a. Philosophical
      b. Professional
      c. Community
      d. Governmental
   4. The nature of retail management

B. Planning for Successful Retail Management
   1. Causes of retail mortality as a means of evaluating potential success
      a. Competence
      b. Experience
      c. Financial ability
      d. Other
   2. Professional and ethical objectives, obligations, and other considerations
      a. Intraprofessional cooperation
      b. Interprofessional cooperation
      c. Ethical and legal requirements
      d. The efficient vs. the marginal operator
   3. Personal considerations
      a. Attitude
      b. Physical stamina
      c. Objectives
      d. Other
   4. Advantages and disadvantages of business ownership
      a. Freedom of choice vs. subservience
      b. Regular vs. irregular hours
      c. Regular vs. irregular income
      d. Leadership vs. followership ability
      e. Investment return vs. no investment
      f. Reputation vs. non-identity

C. Planning the Pharmacy
   1. Types of retail operations
      a. Professional
      b. Traditional
      c. Promotional
      d. Other
   2. Location considerations
      a. Community influences
      b. Types of business sites
      c. Factors affecting choice of site
      d. Personal and family influences
   3. Financial considerations
      a. Needs for capital
      b. Sources of capital
      c. Methods of investment determination
      d. Other
   4. Organization considerations
      a. Ownership structures
      b. Employee structures
      c. Franchise or agency values
      d. Featured departments
      e. Nonfeatured departments
      f. Sundry sections

D. Organizing the Pharmacy
   1. The building as an entity
      a. Leasehold considerations
      b. Ownership considerations
      c. Storeroom space vs. functional requirements
      d. Over-all construction considerations
      e. Remodeling needs — present; future
      f. Legal requirements as a pharmacy
   2. The layout of the storeroom
      a. Major business objectives
      b. Location of major departments
      c. Location of minor departments
      d. Location of nondepartment sections or groups
      e. Fundamental factors of layout
      f. Provision for diversification
      g. Self-service, semi-self-service and service requirements
      h. Location of nonselling service areas
   3. Supplying the physical factors of environment
      a. Functions of fixtures and equipment
      b. Sources of various kinds of fixtures and equipment

c. Costs and financing of various kinds of fixtures and equipment
d. State and local legal requirements and restrictions
e. Floor coverings: design, material, safety factors
f. Lighting: selling area, nonselling area, special needs
g. Air conditioning and heating
h. Over-all plan of decoration as a pharmacy

E. Financial Management
1. Policy formulation
2. Accounting controls
a. The cash register as a tool
b. Use and value of sales slips
c. Proper records for retailing
d. Value of accounting records
e. Inventory control and accounting
f. Expense control and accounting
g. Determination of profit
h. Accounting analysis for management decisions
3. Credit and collections
a. Types of retail credit
b. Importance of retail credit
c. Credit procedures — sales
d. Credit procedures — collections
4. Risk and insurance
a. The nature of insurable risks
b. Types of insurance companies
c. Specific insurance coverages necessary
d. Other considerations
5. The use of commercial money agencies
a. The bank — short- and long-term loans
b. Savings vs. checking accounts
c. Loan sharks as source of funds
d. Investment brokers to use funds

F. Merchandise Management
1. Policy formulation
2. Buying procedures
a. Analysis of consumer demand
b. Sources of supply
c. Stock planning for sales
d. Purchase planning and budgeting
e. Buying records
f. Terms, datings, discounts
g. Fallacy vs. value of deal buying
h. Model stocks and re-order rates
3. Receiving and handling procedures
a. The receiving area
b. The invoice and/or packing slip
c. Marking procedures
d. Distributing procedures
e. Excess merchandise stock
f. Breakage and damaged goods
4. Pricing procedures, and the economics of pricing
a. Costs as basis for price
b. Competition and pricing
c. Price lines
d. Markup determination
e. Markdown considerations
f. Mathematics of pricing
g. Franchise pricing factors
h. Price vs. value
i. Loss-leader pricing
j. Break-even point analysis and pricing
k. Prescription pricing, elements of
l. Pricing schedules, pro and con
5. Selling procedures
a. Mechanics of sales and selling
b. Handling of merchandise
c. Receiving payment for goods
d. Sales returns
e. Discounts and allowances on sales
6. Control procedures for merchandise
a. The physical inventory
b. The book inventory
c. Stock shortages and overages
d. The retail method of control
e. The cost method of control
f. Re-order control systems and methods
g. Turnover considerations
h. Commercial sources of assistance

G. Personnel Management
1. Policy formulation
2. Store organization
a. Analysis of store functions
b. Assignment of responsibility
c. Factors of expense control
d. Layout considerations
3. Personnel supply
a. Sources of employees
b. Job analysis and specification
c. Employee selection
d. Professional considerations
4. Training and supervision
a. Initial procedural training
b. In-store training programs
c. Out-of-store training programs
d. Supervision and control
5. Compensation and maintenance
a. Employee evaluation
b. Management evaluation
c. Turnover factors
d. Compensation methods
e. Noncompensating side-benefits
f. Complaints and suggestions
6. Miscellaneous considerations regarding personnel
a. Dismissal and resignation
b. Professional vs. nonprofessional employee status
c. Part-time employment practices
d. Communication and employee relations
e. Professional organization
f. Management and labor unionization
g. Other

H. Public Relations and the Pharmacy
1. Policy formulation
2. Internal activities
a. Professional service
b. Nonprofessional service

c. Service vs. self-service
d. Quality of salesmanship
e. General store atmosphere and attitude
3. External activities
a. Competitive practices
b. Advertising: quality and quantity
c. Civic cooperation
d. Political activities
e. Religious activities
f. Fraternal activities

Report on Management

by Robert V. Evanson

Merchandising (required)

Prerequisites should include Management, Drugstore Management or Retailing by whatever name cataloged. (See also prerequisites for that course.)

Other courses which would have value as background courses include Marketing, Economics of Consumption, Psychology, Sociology, General courses in Advertising and/or Salesmanship, Pharmaceutical Detailing.

This should be a one-semester course in the fifth year — semester 9 or 10 — and taught in the form of three lecture periods or two lecture periods and one laboratory, or two lecture periods and one recitation period, for a minimum of three (3) credits.

The course should be taught by the professor of pharmacy administration.

The course should be developed with as many cases as will suffice to serve as examples for the practical application of the principles of merchandising to show how different methods for doing the same thing have been equally successful under different situations and circumstances.

Catalog Description: Retail sales promotion, including store arrangement, display advertising, salesmanship, buying habits and motives, and competitive practices.

Course Content:

A. Precursors to Merchandising
1. Sociological considerations
a. Urban families
b. Rural families
c. Social group mores
d. Socio-economic classifications
2. Psychological considerations
a. Effects on display efforts and results
b. Effects on advertising
c. Effects on salesmanship
d. Atmosphere for selling
e. Necessity for confidence
3. Philosophical considerations
a. Ethical concepts of business
b. Religious factors
c. Philosophy of personal life
d. Philosophy of retailing
4. Professional considerations
a. Attitudes toward promotional techniques
b. Emphasis on personal and business objectives
5. Economic considerations
a. Utility — need vs. want vs. desire
b. Supply and demand
c. Elasticity of demand
d. Value vs. price
e. Economic substitution
f. Application to merchandising
6. Competition and competitive practices
a. Economic vs. noneconomic competition
b. Theory vs. practice
c. Types of competition applied to the retail drug business
d. Professional vs. nonprofessional

B. Buying Motives and Habits
1. Buying motives
a. Product — rational, emotional
b. Patronage — rational, emotional
2. Buying habits
a. When do people buy?
b. Where do people buy?
c. How do people buy?
d. What do people buy?
3. A theory of consumption: This should be developed by the instructor according to his objectives and the characteristics of the general or specific area discussed or served.
4. A theory of retail pharmacy merchandising: This should be developed by the instructor and the class as a means of pointing the course toward the type of retail merchandising as satisfies the general and/or specific needs of the class, or the particular ideas the instructor wishes to expand and stress in view of present and future retailing trends.

C. Advertising
1. General considerations
a. Reasons for advertising
b. Policy formulation
c. Advertising vs. publicity
d. Costs involved — accepted standards
2. Advertising media
a. Local media available for use
b. National media and the retailer
c. Media suitable in various situations
d. Agencies and media connections
3. Types of advertising
a. Five basic types of ads
b. Uses of each type

c. Advantages and disadvantages of each
d. Value of each per situation
4. Advertising layout
a. Styles and sizes of ads
b. The agate line measure
c. The column inch measure
d. Copy style and content
e. Specific parts of an ad and the function of each
5. Measuring advertising results
a. Sales data on advertised items
b. Traffic data
c. Research indexes of listenership for radio and TV programs
d. Potential circulation data
e. Special offers requiring some form of tangible and immediate action
f. Other measures
6. Service advertising
a. Professional detailing
b. Civic cooperation
c. Utility agencies
d. General public relations
7. Publicity
a. Personal
b. Business
c. Social
d. Civic
e. Antagonistic

D. Window Display
1. Objectives of window displays
2. Functions of window displays
3. Types of design
4. Styles and types of windows
5. Elements of good window display
6. Open-style store fronts as quasi-windows
7. Techniques involved in handling crepe paper
8. Specific demonstrations or films or slides to illustrate points

E. Interior Display and Layout
1. Objectives of layout and display
2. Functions of layout and display
3. Departmentization
a. Major or featured departments
b. Minor but necessary departments
c. Minor but unnecessary departments
d. Nondepartment sections and groups
4. Effects of layout on interior display
a. Closed-service units
b. Self-service units
c. Columns, angles, multi-levels
d. Hot-spot locations
5. Types of displays and their uses
a. Selling
b. Decorative
c. Advertising
d. Counter
e. Floor
f. Other types
6. Display theories
a. Demand goods
b. Impulse goods
c. Right-hand rule
d. Large vs. small
7. Mechanics of display: Here the instructor with suitable laboratory or retail store facilities can provide contact work or assign contact study analysis projects; here also can be used the available films and slides to demonstrate and illustrate.

F. Selling and Salesmanship
1. What is selling and/or salesmanship?
a. Definitions
b. Objectives
c. Opportunities at retail level
d. Rewards and results
2. Qualifications for selling
a. Character qualities
b. Mental qualities
c. Human qualities
d. Appearance
3. The sales process
a. Approaching the customer
b. Determination of need
c. Selection of merchandise
d. Sales presentation
e. Handling objections
f. Closing the sale
4. Sales training for retail selling
a. On-the-job training, informal
b. Formal in-store training
c. Out-of-store training such as clinics and conferences
d. Special training schools
e. Subject matter of training programs
f. Need for and value of sales training
g. Use of visual aids
5. Special selling techniques
a. Telephone selling
b. Service selling
c. Substitute selling
d. Professional detailing
e. Selling "gimmicks"
f. Silent selling through display

G. Sales Promotion for the Retail Pharmacy
1. Policy formulation
2. Determination of the total promotion program
a. Objectives of the business
b. Selling philosophies for program
c. Promotion media to be utilized
d. Extent of program
e. Promotion budgets
3. The role of the manufacturer and wholesaler in retail promotions
4. Promotion aids from other sources outside of retail store
5. Evaluation of promotions by promotion periods (weekly, monthly, quarterly, etc.)

H. Sales Promotion by Departments
1. Specific departments to be considered

a. Prescription
b. Prescription accessories
c. Drug
d. First aid and hospital supplies
e. Animal health
f. Cosmetics
g. Toiletries
h. Baby goods
i. Fountain
j. Stationery
k. Feminine hygiene
l. Tobacco and candy
m. Photo supplies
n. Diabetic supplies
o. Orthopedic supplies
p. Sundries or other

2. Specific promotional considerations for each individual department
   a. Advertising program
   b. Quality of service necessary
   c. Quantity of service necessary
   d. Nature of the merchandise
   e. Special display considerations
   f. Pricing policies and practices
   g. Elasticity of demand for the department and for individual items
   h. Required departmental atmosphere
   i. Window display potential or need
   j. Selling techniques
   k. Professional detailing
   l. Special sales event potential
   m. Merchandise service necessary
   n. Other

I. Laboratory (If and when used)
   1. Planning, organizing, and executing window displays
   2. Selling and salesmanship theory and practice in a model pharmacy
   3. Interior display and store layout

J. Additional Considerations for both Management and Merchandising: Term reports, audio-visual aids, guest speakers. The merchandising course also lends itself well to open-forum style discussion periods, panel discussions, and debates which serve to cause the student to analyze the situation and formulate his own opinion or plan of attack.

Personal Remarks: The Management—Merchandising outlines have been submitted with this report for three reasons. First, the Chairman was assigned as Chairman with no specific course area for consideration. Therefore, he assumed interest in all courses with the assumption taken that change was not as important as real planning for future need in hours and content. Second, it was and is apparent that there can be very little change in standard courses in economics and accounting and marketing except to work with pharmaceutical examples. In the majority of cases these courses will be taught of necessity outside of the pharmacy school faculty; at any rate, the information lends itself well to one semester. Third, the areas of law and management lend themselves to division because of the complete differentiation of material which is possible. The law has been covered in such a fashion. This left only the Merchandising division for special study.

The five year extended program should carry a Management-Merchandising sequence in order to include not only a minimum of six credit hours in this field, but also to divide them to permit concentrated study of one phase at a time. This sequence has been accepted on a required basis in at least one school, and is offered here to complete this report in order that every teacher may have the opportunity to study its contents, along with the one-semester outline so that either may be used or revised to meet existing conditions in the individual school curriculum.

MARKETING

[MARKETING DRUG PRODUCTS]

JOHN A. LYNCH

The pressure of present-day competition makes it imperative for the retail pharmacist to know and understand the many trends of modern pharmacy. Recognition of the problems confronting the profession from the manufacture of a drug product to its ultimate destination in the hands of the consumer is vital to the profitable conduct of a retail pharmacy.

Since the modern pharmacy school curriculum limits more and more the time a student can spend as an undergraduate apprentice, many of the various facets of the profession formerly acquired while working under a preceptor must be presented in the pharmacy management courses, even though these courses are necessarily limited. Here the student must learn of the problems presented to the manufacturer, his need for the wholesaler, the varied methods of production and distribution, market information, etc.

The great changes occurring in the pharmaceutical profession particularly in the past twenty-five years have made it dramatically apparent that marketing research is of the utmost importance. Publications such as the *Lilly Digest,* the *Drug Topics* annual prescription survey, Abbott's prescription study, and the survey conducted by the *American Druggist* all furnish up-to-the minute information on marketing drug products.

Field trips to pharmaceutical manufacturers and wholesalers are also valuable to students. They see, at first hand, the practical application of theories and procedures discussed in class.

Marketing is merely a background course, but a most essential one to successful drugstore management. There are several very helpful textbooks which I use as a basis for the outline of my course. They are Dr. Paul Olsen's *Marketing Drug Products,* Maynard & Nolen's *Drug Store Management* and the *Pharmacist in Retail Distribution* by Chute and Hall.

Report on Marketing

by John A. Lynch

Marketing Drug Products (required)

Specific prerequisite for this course is Principles of Economics.

A course of background value but not required is Marketing Introduction.

This course should be a two-semester course offered during semesters seven and eight for three credit hours per semester, or a total of six credits.

This course should be taught by the professor of pharmacy administration.

Some case studies should be or could be used.

Catalog Description: This course should acquaint students with the various methods by which medicines and drug products are marketed. It should contain basic principles concerning production, distribution, and consumption.

Course Content:

A. Introduction
   1. Organization and course requirements
   2. Problems for today's pharmacists

B. Types of Marketing Agencies Used in Distribution of Medicinal and Related Products
   1. Manufacturers and processors
   2. Commission houses
   3. Sales agents
   4. Manufacturers' branch houses
   5. Full-line wholesale druggists
   6. Retailer-owned wholesale druggists
   7. Short-line wholesale druggists
   8. Individually-owned and chain drugstores
   9. Physicians' supply houses
   10. Mail order houses
   11. Department stores
   12. Variety stores
   13. Hospitals and dispensaries
   14. Physicians, dentists, veterinarians
   15. Wagon routes and other canvassers
   16. Rack jobber

C. Classes of Merchandise Marketed Through the Drug Trade
   1. Of major importance
      a. Drugs, chemicals, and proprietary prescription specialties
      b. Other proprietary medicines and preparations
      c. Serums, vaccines, and biological preparations
      d. Sickroom supplies, wound dressings, and sanitary aids
      e. Trusses and orthopedic aids
      f. Infant, invalid, and other special foods
      g. Infant supplies
      h. Veterinary medicines, foods, and supplies
      i. Insecticides, fungicides, and rodent poisons
      j. Household disinfectants and deodorants
      k. Spices and food flavors
      l. Chemicals for use in the arts and sciences
      m. Toilet articles and preparations
      n. Cleaning and dyeing preparations
   2. Sidelines
      a. Seeds and fertilizers
      b. Paints, oils, and glass
      c. Tobacco products
      d. Stationery
      e. Soda fountain and other food services
      f. Books and periodicals
      g. Sporting goods
      h. Electrical appliances
      i. Cameras, films, and photographic finishing services

j. Other merchandise and services
D. Types of Drugstores
1. Chain drugstores
2. Individually-owned city center pharmacies
3. City neighborhood pharmacies
4. Department store pharmacies
5. Pharmacies in small cities
6. Professional pharmacies
7. Suburban pharmacies
8. Shopping center pharmacies
E. Packaging and Identification
1. Trademarks
2. Copyrights
3. Patents
F. Measurement of Demand
1. Product uses
2. Potential users
3. Rate of consumption
4. Competition
5. Consumer income
G. Price Problems and Policies
1. Quantity discounts and "free" goods
2. Legal controls on resale prices
3. State unfair practices acts
4. Selling costs
5. Federal laws
6. State fair trade acts
H. Promotion Methods
1. Promotion by mail
2. Sampling
3. Displays and demonstrations
4. General periodicals
5. Periodical advertising and publicity
6. Professional and trade journals
7. Radio broadcasting and television
8. Other media
I. Buying and Stock Control in Pharmacies
1. Chain drugstores
2. Individually-owned pharmacies
J. Competition Among Different Types of Wholesale Marketing Agencies
1. Full-line wholesale druggists
2. Retailer-owned wholesalers
3. Other wholesalers
K. Competition in Retail Marketing
1. Pharmacies
2. Variety stores
3. Tobacco stores
4. General stores
5. House-to-house vendors
6. Mail order houses
7. Discount houses
8. Other retailers
L. Field Trips to Wholesale Houses and to Drug Manufacturing Plants: During these trips the students see and are in close contact with the operation of wholesale and manufacturing plants and observe the marketing of drug products in action.

Personal Remarks: I contacted both Dr. Paul C. Olsen, and Mr. Edward Carroll of Merck, Sharp & Dohme, and discussed with them the field of marketing in relation to this report. I also referred to Maynard & Nolen *Drug Store Management* and *The Pharmacist in Retail Distribution* by Chute and Hall. The latter book is the textbook that we have been using at Temple University School of Pharmacy for the past two years.

PHARMACEUTICAL JURISPRUDENCE IN THE FIVE YEAR CURRICULUM

PAUL A. PUMPIAN

In 1952 recommendations were published in *The Pharmaceutical Curriculum* of Lloyd E. Blauch and George L. Webster which concerned, among others, the subject of pharmaceutical law. It is of interest to note that at that time it was suggested that the course carry three semester hours of credit and that, additionally, a course in business law could be offered to the pharmacy students. Further comments concerning the teachers of pharmacy administration indicated the desirability of having persons trained in pharmacy and business administration and/or law supervise the presentation of courses in this area, those persons to have acquired a degree in the particular field of instruction in which they were engaged. Today, some six years later, when the schools of pharmacy are on the threshold of beginning a five year curriculum, it is time that we once again look into the subject of pharmaceutical law.

With the expansion of the length of time the future pharmacist is now to devote to his academic training, every effort must be made to better equip the student in areas in which his training has previously been lacking. In the field of pharmacy administration the student's training in law has left much to be desired. Some schools are doing an excellent job of acquainting the student with the legal considerations involved in maintaining and operating a retail

and/or hospital pharmacy; but, this is not true of all schools. A function of this section should be to establish a curriculum and syllabus, which can serve as a guide for all schools to follow. To establish an identical syllabus in each school of pharmacy is, of course, impossible. But, to do away with the extreme variation which exists in the schools today in the presentation of the material dealing with the law as applied to pharmacy, and to direct the thoughts of our fellow educators toward a syllabus accepted as desirable by us, should be the prime functions of this group at the present time.

To illustrate what is meant by this "extreme variation" let us look at this subject as it is being presented at the schools of pharmacy today. Examination of the available current catalogues of our schools of pharmacy discloses the existence of this "extreme variation." For example, the credit given for the subject matter which essentially consists of the law as it applies to pharmacy ranges from one to six with the largest number of schools giving either two or three credits (Addendum, Section 1).

The time at which the student receives his formal instruction in this subject matter varies from the last contact session (last session of the senior year) to a term much earlier in his academic training, for example, the sophomore year (Addendum, Section 2). While all courses are concerned primarily with legislation and regulations (federal and state) affecting the practice of pharmacy, some catalogue descriptions indicate that the course also includes business law, ethics, and a discussion of patents, trademarks, and copyrights (Addendum, Section 3a). In six colleges an additional course in business law may be taken as an elective (Addendum, Section 3b).

As is obvious from section four of the addendum, the title given this subject matter varies considerably from school to school. It is known by no less than fifteen names in sixty-three of our schools.

A purpose of the Committee to Study Curriculum and Syllabi of this section is to recommend to you for your consideration a syllabus to be followed in your schools in setting up the various pharmacy administration courses. As you will note, titles for the courses, number of credits to be given, prerequisites, etc. have been included in the reports which have been distributed to you.

It is recommended that the course dealing with the law as it relates to pharmacy and pharmacists be known as *Pharmaceutical Jurisprudence;* "pharmaceutical" meaning "pertaining to pharmacy" and "jurisprudence" being defined in *Black's Law Dictionary* (3rd Edition) as "the philosophy of law, or the science which treats of the principles of positive law and legal relations."

The recommendation that accounting and management courses be prerequisites for the student taking pharmaceutical jurisprudence will undoubtedly elicit much comment, especially from those who think the accounting and management courses should be offered to the student in his last year. The primary purpose in requiring these courses as prerequisites is that many legal points are raised in both accounting and management courses which the instructor cannot dwell upon because of the lack of time. The recommended six credits will allow the instructor in pharmaceutical jurisprudence ample time to discuss those points raised in accounting and management as well as provide him with sufficient time to present the basic material recommended for this course. Economics and political science (American government) should be considered as background courses of value to the student who will someday sit in the pharmaceutical jurisprudence class. The value of such courses is based on the familiarity the

student will acquire with such topics as business organizations, the three areas of government, the various governmental agencies and administrative bodies, etc.

The recommendation that the course be presented during the last professional year of the student's academic training is prompted by the desirability of having the student receive the latest information about the law. Violations on his part would prove to be embarrassing and detrimental to his standing in the community because of the criminal action or civil litigation which could result from his ignorance of the law; or, such violations could cause the pharmacist to lose his privilege of practicing pharmacy.

Examination of the committee report will show that two semesters of three hours each are suggested, the first semester being devoted to the legislation and regulations governing the practice of pharmacy and the second being devoted to what is commonly referred to as "business law." While it is desirable that the entire six credits be made a requirement for graduation, it is understandable that all schools will not be able to devote six hours to this subject matter, and, therefore, the report contains suggestions as to which parts of the syllabus may be eliminated when only a four hour course is to be given. To present the subject matter, as outlined in the committee report, in less than four hours would be unjust to the student, to the instructor, and to the subject matter.

The member of the faculty presenting pharmaceutical jurisprudence to the students requires a special type of training. Unfortunately not all schools are able to obtain the services of a person with the ideal background, namely, training in both pharmacy and law, and, therefore, the schools must utilize the services of persons with other suitable qualifications. Examination of the available pharmacy school catalogues reveals that this subject is being presented by full-time faculty members in twenty-six of our schools and part-time faculty in twenty-three. Of the full-time faculty, twelve are members of the department of pharmacy administration, eight are serving as the administrative head of the school, three are members of the pharmacy department and three are from other departments; the part-time faculty members are generally considered to be members of the department of pharmacy administration. Of further interest is the fact that of the forty-nine faculty members presenting these courses, only twenty-six possess a degree from a school of law of whom only nine also have a degree in pharmacy. Unfortunately, it was impossible to determine from the catalogues the background and status of the faculty members in fourteen of the schools (Addendum, Section 5).

While it is true that seldom are full-time members of the department of pharmacy administration trained in both pharmacy and law, there are times when they should be considered to be qualified to present pharmaceutical jurisprudence. Such would be the situation if the full-time faculty member had received, in addition to his pharmacy training, some training at a law school, primarily in the fields of contracts and agency or had completed courses in business law as part of a graduate program in business administration. Of greater value, however, would be the acquisition of the services of a law school graduate with a knowledge of pharmacy such as is obtained by attorneys representing local or state pharmaceutical associations or by legal counsel of national pharmaceutical organizations. There is, of course, the possibility of obtaining the services of a member of the faculty of a law school who has acquainted himself with pharmacy preparatory to joining the pharmacy faculty.

The subject matter recommended for presentation to the students during

the first semester is similar to the recommendations published by Blauch and Webster. The content has been expanded in certain areas which will be apparent on reading the report of the committee. To go into the material recommended for inclusion in the course is not necessary as it is self-explanatory.

With your permission, I would, however, like to dwell on just one section of the proposed syllabus—patents, trademarks, and copyrights. With the government inquiring into antitrust situations involving patents, the patent system is receiving much adverse publicity. Additionally, much publicity has been given in the pharmaceutical press to the recent attempt made at the Fourth Pan-American Congress of Pharmacy and Biochemistry to have a resolution passed which called for the abolition of patents on ethical pharmaceutical products. This type of publicity will undoubtedly raise questions in the minds of the future pharmacists regarding our patent system, and such questions should be answered when possible.

The ever-present fight of the manufacturer and the boards of pharmacy against substitution by the retail pharmacist has as its basis the protection the manufacturer gains from his possession, ownership, and use of trademarks. With copyrights being considered and often being confused with the subject of patents and trademarks, and because of the public interest in these subjects, the future pharmacist should be acquainted with the subject matter dealing with patents, trademarks, and copyrights as a part of his training in pharmaceutical jurisprudence.

Additionally, I would like to suggest to the members of the graduate faculties of the schools of pharmacy that consideration be given to the inclusion of a course in patents, trademarks, and copyrights, specifically designed for the Ph.D. candidate. It is not intended that these graduate students become so familiar with this subject matter that they will be able to be independently capable of handling matters in this field but that they should be acquainted with this area so that when the occasion arises after they have entered industry or completed research at a university, they will not find that they have not followed practices necessary for suitable patent protection.

The syllabus for the second semester of pharmaceutical jurisprudence is devoted exclusively to business law and will be found to be similar to the business law courses offered at many schools of business administration with the exception of Section D which has been added, and which specificially deals with the purchase of a retail pharmacy. Within the area of "business law," it is suggested that special emphasis be given to that portion of sales (Section C) which deals with product liability. You no doubt recall the publicity given to a recent court decision concerning the question of the liability of a pharmaceutical manufacturer to the ultimate consumer—a decision which will long be under discussion and, in all probability, subject to further litigation. The necessity of including business law in the curriculum has already been recognized by at least twenty-one of our schools of pharmacy, and undoubtedly others are considering such an addition.

In conclusion, it should be stated that pharmaceutical jurisprudence is an important part of the pharmacy curriculum. It can be an extremely interesting course if presented by a qualified person who is familiar with the problems of pharmacy and is sufficiently trained in the law so that the students will be able to ask and receive answers to the many questions such a course will elicit. The reception by the students of the course in pharmaceutical jurisprudence should

be excellent when properly presented inasmuch as it deals with a subject with which the students have daily contact but of which they have very little knowledge.

It, therefore, is recommended that this body adopt the recommendation that pharmaceutical jurisprudence be presented during the last professional year as a six hour course embodying the subject matter as outlined in the report circulated by the Committee to Study Curriculum and Syllabi of the Section of Teachers of Pharmacy Administration.

ADDENDUM

An Analysis of Pharmaceutical Jurisprudence as Presented at the Schools of Pharmacy

(Based on an examination of the current catalogues of sixty-three Schools of Pharmacy, March, 1958)

1. Semester Hours of Instruction

Hours	Number of Colleges
6	1
5	1
4	4 (3 of which award quarter credits)
3	29 (8 of which award quarter credits)
2	26
1	2

2. Term of Offering

Term		Number of Colleges	
Last contact session	—	37	(5 are optional as to term but require that course be taken in last year)
Last session minus one	—	11	
Last session minus two	—	7	
Last session minus three	—	5	
Last session minus four	—	3	

3. (a) The subject matter is concerned primarily with legislation and regulations affecting pharmacy; additionally, the following topics are included as indicated:

Business law	15 schools
Patent, trademarks, copyrights	3 schools
Ethics	2 schools
Economics	1 school

(b) Separate business law courses are being offered in six schools as indicated:

1 school	—	10 credits
1 school	—	6 credits
2 schools	—	3 credits
2 schools	—	2 credits

4. Titles Utilized:

Pharmaceutical Jurisprudence	17 schools
Pharmaceutical Law	14 schools
Pharmacy Law (Laws)	13 schools
Jurisprudence	8 schools

Other titles utilized—1 school each
Pharmaceutical Law and Ethics

Jurisprudence and Ethics
Pharmacy Laws and Ethics
Pharmaceutical Laws and Regulations
Pharmaceutical Jurisprudence and Economics
Pharmaceutical and Commercial Law
Laws of Pharmacy
Professional Law
Administration
Law
Drugstore Practice

5. Faculty:
   Full-time faculty in 26 schools
   Part-time faculty in 23 schools
   Undeterminable in 14 schools
   Full-time faculty departmental status:
   12—Department of Pharmacy Administration
   8—Administrative (Deans)
   3—Pharmacy Department
   3—Other Departments
   Of the 49 faculty members (full-time + part-time):
   22 possess B.S., M.S., and/or Ph.D.'s,
   26 possess LL.B.'s of whom 9 also possess a pharmacy degree,
   2 possess a Business Administration degree one of whom also possesses a Pharmacy degree.
   Of those teaching the Business Law elective, 4 possess law degrees and 2 Business Administration degrees.
   In 9 of the schools, 2 or more teachers participated in the presentation of the course.

Report on Pharmacy and Business Law

by Paul A. Pumpian

Pharmaceutical Jurisprudence

Accounting and Management are basic prerequisites.

Economics, Political Science (American Government) are of value as background.

This is a two-semester course to be presented in the fifth year—semesters nine and ten—preferably three hours credit, and minimally two hours credit per semester.

This course should be taught by a member of the pharmacy faculty, desirably the professor of pharmacy administration, but only if he has had some training in business law or has completed courses at a law school in contracts and agency minimally. If no pharmaceutically trained member of the faculty possesses this legal training, the courses should be presented by someone outside the school of pharmacy who has the necessary background (e.g., an attorney with pharmacy training, a state pharmaceutical association counsel, the legal representative of a national pharmaceutical organization, a member of the faculty of a school of law who has familiarized himself with the practice of pharmacy).

Catalog Description: (first semester) Legislation and regulations governing the practice of pharmacy; a study of the federal, state, and local laws and regulations pertaining to the handling and sale of drugs, cosmetics, narcotics, poisons, and alcohol; and a review of the fair trade and unfair competition legislation, regulations, court and administrative decisions of import to the pharmacist.

Course Content: (first semester)

A. Power of federal, state and local governments to control the practice of pharmacy
   1. A review of the constitutional powers from which the federal, state and local governments derive their authority to control the practice of pharmacy
   2. Governmental bodies legislating

and regulating within these constitutional powers
a. Federal governmental bodies and their functions (generally)
1. The Congress of the United States
2. The Executive Branch of the United States — Department of Health, Education and Welfare — Food and Drug Administration, Department of the Treasury — Bureau of Narcotics, Department of Agriculture, Federal Trade Commission, other bodies
b. State governmental bodies and and their functions (generally)
1. The State Legislature
2. The Executive Branch of the state government — State Board of Health, State Board of Pharmacy, other bodies
c. Local governmental bodies and their functions (generally)

B. Judicial review of the exercise of governmental functions by the various governmental bodies
1. The United States Courts
a. The Supreme Court of the United States
b. The United States Court of Appeals
c. The United States District Court(s)
d. Legislative courts of the United States
2. State and local courts

C. The State Board of Pharmacy
1. Membership
2. Purpose and functions (detailed)
a. The registered pharmacist
1. Prerequisites for registration
2. Reciprocity
3. Privileges and obligations granted by registration
b. The pharmacy
1. Type of license
2. Conditions for obtaining license
3. Provisions of license
4. Responsibility of licensee
3. Source and limits of authority (detailed)

D. The Pharmacy and Its Personnel
1. Legal classification of the pharmacy personnel
a. Registered pharmacist
b. Pharmacy intern (nonregistered graduate of a school of pharmacy)
c. Pharmacy apprentice (pharmacy school student)
d. Nonprofessional
2. Legal controls of employee relations
a. Minimum wage laws
b. Maximum hour laws
c. Child labor laws
d. Labor relations laws
e. Other pertinent laws
3. Health regulations pertaining to the operations of the pharmacy

E. Food, Drug, Cosmetic and Device Laws
1. Federal Food, Drug and Cosmetic Act (only those parts applicable to dispensing pharmacies)
a. Purpose and function
b. Methods of control
c. Permissible pharmacy sales and dispensing of medication
d. Labelling requirements
e. Other provisions
f. Court decisions
2. State food, drug and cosmetic laws
3. State laws concerning devices such as hypodermic syringes and needles, sutures and sickroom supplies
4. State laws concerning barbituates
5. State laws concerning patent and proprietary medicines

F. Federal, State and Local Narcotic Laws and Regulations
1. Narcotic preparations defined
a. Narcotics
b. Oral narcotics
c. Exempt narcotics
2. The control of narcotics and handlers thereof
a. Licensing handlers
b. Acquiring narcotic preparations
1. Use of federal narcotic order forms
2. Use of state exempt narcotic order forms
c. Storage of narcotics
d. Disposition of narcotics
1. On prescription
2. By other legal means — exempt narcotics, return to vendor, return to Bureau of Narcotics, sale to retail pharmacy, other means
3. Marihuana (cannabis) laws

G. Laws Concerning Poisons (Violent, Caustic, and Economic)
1. Legal definitions of types of poisons
2. Sales restrictions and records
3. Federal and state insecticide, fungicide, herbicide and rodenticide laws, caustic poison laws and violent poison laws

H. Laws Concerning Alcohol and Alcoholic Products
1. Alcohol used in manufacturing and in the compounding of prescriptions, including alcohol tax and drawback provisions
2. Denatured alcohol
3. Malt, vinous and distilled preparations

I. Laws Concerning Prescription Compounding
1. Definition of prescription — the paper

2. Degree of care and skill required of the pharmacist by law
3. Types of errors
4. Right to refuse to compound
5. Labelling
6. Record keeping
7. Miscellaneous provisions

J. Other Laws Concerning the Prescription Relative to Property Rights and Use as Legal Evidence

K. Regulatory, Criminal, and Other Laws Concerning the Acquisition, Disposition, Labelling, Recording, and Reporting of Drugstore Items

L. Legislation and Laws Related to Commerce
1. Anti-trust laws
a. Sherman Act
b. Federal Trade Commission Act
c. Clayton Act
d. Robinson-Patman Act
e. Other unfair competition legislation
2. Resale price maintenance laws
a. Federal enabling laws
1. Miller-Tydings Act
2. McGuire Act
b. State fair-trade laws
c. Current status of fair trade — state and national
3. Patent, trademark, and copyright laws

M. Court Decisions Cited to Illustrate Charges Brought and Sustained Against Pharmacists — Citations to be Used Throughout the Course to Illustrate Enforcement of the Law Being Discussed

Catalog Description: (second semester) Business Law for Pharmacists — a study of the law applicable to the purchase and operation of a retail pharmacy designed to equip the student with sufficient knowledge of law to enable him to avoid the more common legal errors in business: contracts, agency, sales, torts, insurance, negotiable instruments, real property, partnerships and corporations.

Course Content: (second semester)

A. Contracts
1. Definition
2. Essential elements
3. Void, voidable and unenforceable contracts
4. Types of contracts
5. Discharge of contracts
6. Breach of contract

B. Agency
1. Creation and termination of agency
2. Duties and obligations of principal
3. Duties and obligations of agent

C. Sales
1. The contract
2. Passing of title
3. Warranties
4. Financing
5. Conditional sales and chattel mortgages

D. Purchase of a Pharmacy
1. Option to purchase
2. Bulk sales act
3. Contract of sale
4. Financing

E. Torts
1. Definition
2. Types of torts
3. Liabilities arising from miscellaneous torts particularly applicable to pharmacy:
a. To persons injured on the premises
b. For errors in selling and services
c. Shoplifting and false arrest
d. For sales to minors and incompetents
e. For improper filling of prescriptions

F. Insurance
1. The insurance contract
2. Types of insurance
3. Avoidance and forfeiture

G. Negotiable Instruments
1. Definition
2. Types of negotiable instruments
3. Statutory requisites
4. Rights and defenses
5. Checks

H. Real Property
1. Definition
2. Types of interest in real property
3. Title to real property
4. Buying and selling real property
5. Landlord and tenant
6. Real estate mortgages, liens, incumbrances and restrictions

I. Partnerships
1. Creation
2. Duties, rights, powers and liabilities of partners
3. Remedies against a partner
4. Dissolution

J. Corporation
1. Nature
2. Formation
3. Rights, duties, and liabilities of stockholders
4. Rights, duties, and liabilities of directors and officers
5. The corporation and third parties
6. Dissolution

K. Miscellaneous
1. Wills
2. Bankruptcy
3. Enforcement of remedies
4. State and local court system
5. Explanation of procedures followed in bringing a lawsuit

Personal Remarks: This syllabus has been prepared for a two-semester, three-hour-per-semester course. A two-hour-per-semester course would necessitate the elimination of certain topics. It is suggested that during the first semester the use of case studies could be limited and certain

portions of the material eliminated (e.g., sections A-1, B, H, I-2, I-3, I-4, J, and L-1). In the second semester section K could be omitted.

The text material required of the student could be supplemented by the instructor's distributing mimeographed material detailing procedures to follow in:

1. Complying with the Durham-Humphrey Act which allows the receipt of oral instructions for the filling and refilling of prescriptions.
2. Complying with the law enabling the acceptance of oral narcotic Rx's.
3. Ordering federal narcotic order forms.
4. Using the federal narcotic order forms to purchase narcotics.

In my opinion it is of the utmost importance to have the first semester of this course presented by someone who is familiar with pharmacy. The second semester may be presented by someone less familiar with pharmacy than with law so long as he is familiar with the procedural aspects of purchasing and operating a retail enterprise. It will, of course, provide for the best type of instruction if the lecturer has been trained in and gained experience in both retail pharmacy and the practice of law.

CONCLUSIONS

ROBERT V. EVANSON

A review of the outlines and discussions by the committee members shows that a total of thirty-three credit hours in nine different course headings have been offered. Twelve of these credit hours lie in economics which, according to the general opinion expressed by the group in attendance, should be considered as basic education in the social sciences and not charged against the pharmacy administration curriculum load. Regardless of mechanics and area assignments, it seems to be generally accepted that from three to six credit hours in economic principles are mandatory as a part of the curriculum.

Also apparent from the Committee Report and the discussion from the floor is the fact that the curriculum should offer a minimum of twelve credit hours consisting of three credit hours each in accounting, jurisprudence (pharmacy law), management and marketing. However, as many additional hours as possible up to a full complement of twenty-four credit hours embodying six hours of each subject should be considered as desirable and within the reasonable limits of an equalized curriculum. A compromise of eighteen credit hours would place the extra emphasis on additional work in management and on business law.

Another important factor in the extended program will be the opportunity for the student to elect a greater number of courses of his own choosing for personal development. Through this process personal desire and proper counseling will enable the student to enhance and expand his knowledge of the business world which will be so necessary a part of his professional and personal success. It is therefore of major importance that as many courses as possible be available, both required and elective, to provide the opportunity for intellectual development in the area of pharmacy administration.

The failure to keep words and actions in harmony has been the cause of much injury to pharmacy.

Robert L. Swain, Am. J. Pharm. Ed., 5, 299 (1941)

FINANCIAL SCHEDULES: A TEACHING AID IN THE DETERMINATION OF THE CAPITAL REQUIREMENTS NECESSARY FOR OPENING A NEW DRUGSTORE*

ISIDORE GREENBERG AND ABRAHAM KREISER

INTRODUCTION

Jeffries and Greenberg (1) recommended that in order to make the study of the principles of drugstore management more meaningful and lasting to the student, classroom discussions and textbook assignments should be supplemented by field projects, simulating as closely as possible conditions that might be met in practice. Experience has justified the validity of this recommendation. Students have, in general, received these field projects well and, on innumerable occasions, have expressed themselves as to their value. It is interesting to note that visiting graduates have reported that the experience gained in the field projects was of great help to them when they had opened or purchased their own pharmacy. Parenthetically, a note of caution to the teacher must be injected here. The field projects do entail a great deal of work and consequently must be adjusted to the students' over-all load; otherwise they may become bogged down.

Project No. 2 in the series is entitled "Financing the Drugstore." This follows logically and chronologically from the first, which deals with site selection. Of all the projects, financing probably requires the greatest amount of technical competence and is the area in which the student has the least amount of personal experience to draw on. Further, proper and adequate financing is very closely associated with success in the management of a drugstore, especially during the early, formative years. Studies have shown, repeatedly, that improper and inadequate financing is a major cause of business mortality (2).

Consequently, it becomes mandatory to give the student complete and thorough instruction in the development and preparation of schedules of financial requirements during the initial opening of the drugstore as well as during the period when sales volume is building up to the point where the business can pay its own way. In the progress of the development of these schedules all the possible situations that may arise are brought to the students' attention as well as those ratios and analytical tools needed to make intelligent decisions for further action. It is the purpose of this paper to delineate a set of schedules, to elaborate on the problems that may be faced and the principles that may be used to solve them. (The case presented below is hypothetical, but every effort was made to make it as realistic as possible.)

ASSUMPTIONS

Following a careful site study and on the basis of other considerations, the following "facts" and assumptions emerge:

*Presented to the Section of Teachers of Pharmacy Administration, AACP, Los Angeles, California, 1958.

1. Drugstore located in East in city of over 500,000 population (Middle Atlantic)
2. Store size: 80 x 25 ft.; basement of equal size; no fountain; packaged ice cream and candies, tobaccos, various sundries
3. Store empty; moderate state of repair; needs: floor covering, door and window modernization, painting, modern lighting, outside sign
4. Potential sales volume based on site study: $240,000
5. Maximum potential sales reached in 10 months; uniform growth (see discussion below)
6. Expected prescriptions per day: 60
7. Expected operating gross margin: 34.5 per cent
8. Expected turnover: five times per year
9. Rent: $500 per month; 2 per cent on excess of $10,000 per month of sales
10. Two partners: $15,000 cash each

These assumptions, especially as to their quantitative aspects, serve as a limiting basis upon various kinds of expenditures, and their influence can be traced throughout all the subsequent schedules.

THE SCHEDULES

Cash expenditures required for opening and operating a drugstore are varied and diverse. They range through the purchase of such basic needs as fixtures, equipment, and inventory; physical improvements and repairs; essential services; cash and credit purchases; operating expenses when operations are begun; etc., etc. In self defense, the prospective owner must make estimates of all these cash requirements by means of projected schedules based upon the best possible estimates available. In this connection it should be pointed out that the *Lilly Digest* ratios serve as excellent guides.

Our first considerations are those expenditures necessary to get the drugstore prepared for the initial opening. Those required expenditures of a nonrecurring nature are detailed in Schedule 1. It is to be noted that not all items have dollar values included. Circumstances do not require certain expenditures to be made. They are included, however, for pedagogical reasons.

Schedule 1 summarizes the nonrecurring initial capital requirements. Included are down payments for fixtures, equipment, and inventory; physical repairs and improvements to be made to conform with desired appearance of the store; expenditures for services such as legal fees, insurance, and miscellaneous items; and, finally, deposits for rent and utilities.

Schedule 2 summarizes the purchase of fixtures and equipment. It gives details as to total price, down payment, monthly installments, and totals for each. It includes in addition to standard fixtures such items as refrigerators, cash registers, typewriters, air conditioners, and delivery equipment. The total purchase price is $21,200 of which $9,700 is paid down.

Schedule 3 summarizes in greater detail the recurring capital expenditures. Included are all those items for which notes were given. It includes amount of monthly payments, duration of payments, interest rate, etc. Initially, monthly notes total $1,222.

SCHEDULE 1. SUMMARY OF NONRECURRING INITIAL CAPITAL REQUIREMENTS

Item	Amount
1. Purchase of real estate	$——
2. Decorating and remodeling:	
Store front	350
Display windows[a]	——
Doors	——
Awnings	250
Outside sign	500
Ceiling	100
Flooring	300
3. Plumbing	600
4. Lighting	1,000
5. Installation of fixtures & equipment[b]	——
6. Furniture, fixtures & equipment (See Schedule 2)	7,300
7. Initial inventory[c]	7,860
8. Licenses	100
9. Deposits and securities with:	
Telephone company	100
Gas and electric company	100
Water	——
Landlord (3 months)	1,500
10. Financing accounts receivable[d]	300
11. Insurance[e]	1,200
12. Miscellaneous requirements	1,500
13. Legal fees	250
14. Brokerage fees	——
Estimated total initial cash	$23,310

[a] Display windows and doors are usually altered by the landlord.
[b] Included in the price of furniture fixtures and equipment.
[c] Based on a turnover rate of five per year and gross margin of 34.5 per cent; opening requirement: one-half of optimum. See Schedule 3 for financing details.
[d] Amount needed to cover customer credit operations.
[e] $600 for one year coverage; $600 for three year coverage.

Note: All dollar figures in this and the other schedules are rounded to even dollars for simplicity in presentation. In some cases, for this reason, totals will not always conform to the figures above them.

SCHEDULE 2. FURNITURE, FIXTURES AND EQUIPMENT*

Item	Cash Purchase	Installment Purchases Price	Down	Installment	Initial Cash Required
1. Fixt. & equipment[a]		$15,000	$5,000	$312	$5,000
2. Refrigerators (2)		500	200	30	200
3. Cash registers (2)		1,200	300	75	300
4. Typewriter, etc.	$300				300
5. Air conditioner		2,200	1,000	100	1,000
6. Delivery equipment		2,000	500	50	500
Totals	$300	$20,900	$7,000	$567	$7,300

* Total investment in furniture, fixtures, and equipment should be about 10 per cent of estimated projected sales volume.

[a] Included are: wall cases, counters, gondolas, display tables, prescription department fixtures, etc.

Total investment in furniture, fixtures and equipment $21,200. Initial cash requirements (entered as Item 6 in Schedule 1) $7,300.

SCHEDULE 3. TOTAL RECURRING CAPITAL EXPENDITURES ON A MONTHLY BASIS*

Item	Total Price	Down Payment	Monthly Installment	Number of Installments	Interest Rate
1. Furniture & Fixt.	$15,000	$5,000	$312	32	6%
2. Cash registers (2)	1,200	300	75	12	6%
3. Air conditioner	2,200	1,000	100	12	6%
4. Refrigerators (2)	500	200	30	10	6%
5. Delivery equipment	2,000	500	50	30	4%
6. Inventory[a]	15,720	7,860	655	12	4%
Totals	$36,620	$14,860	$1,222		

* Summary of the notes that must be met each month over and above operating expenses, as indicated in Schedule 4. Each item is covered by individual contracts. Interest is computed on the remaining balance, as follows:

1.	$10,000	@ .06 =	$600	÷ 12 =	$50.00/mo.	Diminishes by	$1.56/mo.
2.	900	@ .06 =	54	÷ 12 =	4.50/mo.	Diminishes by	.38/mo.
3.	1,200	@ .06 =	72	÷ 12 =	6.00/mo.	Diminishes by	.50/mo.
4.	300	@ .06 =	18	÷ 12 =	1.50/mo.	Diminishes by	.15/mo.
5.	1,500	@ .04 =	60	÷ 12 =	5.00/mo.	Diminishes by	.17/mo.
6.	7,860	@ .04 =	314	÷ 12 =	26.20/mo.	Diminishes by	2.18/mo.
	$21,760				$93.20		$4.94

[a] The inventory figure is derived as follows: The expected annual sales volume, $240,000, is divided by five, the turnover ratio. This yields the optimum retail value of the inventory. Multiplying this by 65.5 per cent, the expected cost of goods sold, yields $31,440. Since we do not expect to reach maximum sales volume till the tenth month of operations, we start our business with one-half the optimum inventory, $15,720. This is in line with generally recommended practice.

The three preceding schedules together with their footnotes show in considerable detail the expenditures necessary to open the drugstore. Out of the $30,000 of cash contributed by the partners we have already expended some $23,310, leaving about $6,690 for deficit financing for operating expenses, since gross margin from sales during the first several months is not

expected to be adequate for this purpose. As we shall see the $6,690 will not be enough and we shall be compelled to make a loan. Further details of the loan will be outlined below.

In the matter of deficit financing, we should like to digress for a moment and discuss the matter further. It is a well-known fact that during the early stages of a business, actual sales are not in line with *expected* sales volume as the site study indicates. It usually takes varying amounts of time to achieve it. It is during this period that new businesses experience some of their greatest difficulties which may lead to business failure. Many new businessmen fail to provide for this contingency.

The important question is: How much to provide? We have searched the literature but have found nothing. We believe that this area deserves some study on the part of those interested in retail pharmaceutical management. Greenberg (3) has suggested eleven possible factors which may have qualitative and quantitative influences on the rate of sales growth of a newly established drugstore from the initial opening to the first stage when all expenses, operating and capital, can be paid out of gross margin. Among these factors are the following:

1. Character of the site
2. Population character and changes
3. Type of pharmacy: traditional, promotional, professional
4. Size of the operation—initial capital investment
5. Operating cost factors—ratios
6. Promotional activities—types and amounts
7. Seasonality of opening
8. Competitive forces
9. With or without fountain
10. Locality—neighborhood or downtown
11. Chain or independent

In the absence of any published data it becomes necessary for the purposes of this presentation to make an assumption. In the interests of simplicity from both the point of view of the students as well as in the necessary calculations, it was assumed that rate of sales growth would be uniform and require ten months to reach expected levels. Translated into dollars this would mean that sales volume would be $2,000 during the first month and increase by $2,000 a month until the maximum of $20,000 is reached. These figures serve as a most important basis for the computations in Schedule 4.

Schedule 4 details the usual required operating expenditures in the management of a drugstore. Schedule 5 translates the dollar figures from Schedule 4 into percentages. These ratios serve as an important basis for management decisions and also as to whether expenditures are in line. For this purpose both operating expense categories and ratios found in the *Lilly Digest* have been used (4). In addition turnover ratios and break-even sales volumes have been included. Schedule 4, especially as to total gross margin, operating expenditures, capital requirements, and deficits are summarized in Schedule 6.

In Schedule 4 fixed operating expenses are determined on the basis of the Lilly ratios for maximum sales volume. It is interesting to observe in Schedule 5 that while our ratios are high at first, they gradually revert to the standard averages as sales volume increases. Similarly the ratio of employees' salary to sales, 10 per cent, is used as a basis for retaining

SCHEDULE 4. MONTHLY SALES AND OPERATING EXPENSE DATA

Month	1	2	3	4	5	6
Net sales	$2,000	$4,000	$6,000	$8,000	$10,000	$12,000
Gross margin	690	1,380	2,070	2,760	3,450	4,140
Partners' salaries	$1,000	$1,000	$1,000	$1,000	$ 1,000	$ 1,000
Employees' wages			360	360	720	880
Rent	500	500	500	500	500	540
Heat, light, power	140	140	140	140	140	140
Taxes & licenses	25	25	25	25	25	25
Insurance						
Interest paid	93	88	83	78	73	68
Repairs						
Delivery	10	10	10	15	15	20
Advertising	400	400	300	300	300	300
Telephone	10	10	15	15	20	20
Bad debt						5
Miscellaneous	300	300	300	300	300	300
Total expenses	$2,478	$2,463	$2,733	$2,733	$ 3,113	$ 3,298
Net profit (loss)	($1,788)	($1,083)	($663)	$27	$337	$842
Annual T/O ratio	0.996	1.992	2.998	3.984	4.98	5.976

Month	7	8	9	10	11	12
Net sales	$14,000	$16,000	$18,000	$20,000	$20,000	$20,000
Gross margin	4,830	5,520	6,210	6,900	6,900	6,900
Partners' salaries	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Employees' wages	1,440	1,440	1,840	2,000	2,000	2,000
Rent	580	620	660	700	700	700
Heat, light, power	140	140	140	140	140	140
Taxes & licenses	25	25	25	25	25	25
Insurance						
Interest paid	63	58	53	48	43	36
Repairs						
Delivery	25	30	35	40	40	40
Advertising	300	300	300	300	300	300
Depreciation						
Bad debt	5	10	10	15	15	20
Telephone	25	25	30	35	40	40
Miscellaneous	300	300	300	300	300	300
Total expenses	$ 3,903	$ 3,948	$ 4,393	$ 4,603	$ 4,603	$ 4,601
Net profit (loss)	$ 927	$ 1,572	$ 1,817	$ 2,297	$ 2,297	$ 2,299
Annual T/O ratio	6.972	7.968	8.9	10.9	11.8	11.8

Note: Insurance and depreciation not being out-of-pocket costs are not included. No repairs are anticipated. Net profit or loss is not, therefore, strictly in accordance with accounting practice.

Personnel, including pharmacists and others, are employed as the volume of sales warrants. Employees to sales ratio, 10 per cent, is used as a guide.

SCHEDULE 5. MONTHLY SALES AND OPERATING EXPENSE PER CENTS

Month	1	2	3	4	5	6
Net sales	100.0	100.0	100.0	100.0	100.0	100.0
Gross margin	34.5	34.5	34.5	34.5	34.5	34.5
Partners' salaries	50.0	25.0	16.6	12.5	10.0	8.3
Employees' wages	0.0	0.0	6.0	4.1	9.2	7.3
Rent	25.0	12.5	8.3	6.3	5.0	4.5
Heat, light, power	7.0	3.5	2.3	1.8	1.4	1.2
Taxes and licenses	1.3	0.6	0.4	0.3	0.25	0.19
Insurance	3.3	1.7	1.1	0.8	0.7	0.6
Interest paid	4.7	2.2	1.4	0.97	0.7	0.57
Delivery	0.5	0.25	0.16	0.19	0.15	0.16
Advertising	20.0	10.0	5.0	3.8	3.0	2.5
Depreciation	9.8	4.9	3.3	2.5	1.96	1.6
Bad debt	0.0	0.0	0.0	0.0	0.0	0.04
Telephone	0.5	0.25	0.25	0.19	0.2	0.16
Miscellaneous	15.0	7.5	5.0	3.8	3.0	2.5
Total expenses	123.9	61.5	45.5	34.1	33.1	28.3
Net profit (loss)	(89.4)	(27.1)	(11.5)	0.34	3.37	7.02

Month	7	8	9	10	11	12
Net sales	100.0	100.0	100.0	100.0	100.0	100.0
Gross margin	34.5	34.5	34.5	34.5	34.5	34.5
Partners' salaries	7.14	6.25	5.56	5.0	5.0	5.0
Employees' wages	10.3	9.0	10.2	10.0	10.0	10.0
Rent	4.14	3.87	3.67	3.5	3.5	3.5
Heat, light, power	1.0	0.9	0.78	0.7	0.7	0.7
Taxes and licenses	0.18	0.16	0.14	0.13	0.13	0.13
Insurance	0.47	0.41	0.37	0.33	0.33	0.33
Interest paid	0.45	0.36	0.3	0.24	0.21	0.18
Delivery	0.18	0.19	0.2	0.2	0.2	0.2
Advertising	2.14	1.9	1.67	1.5	1.5	1.5
Depreciation	1.40	1.23	1.09	0.98	0.98	0.98
Bad debt	0.04	0.06	0.06	0.07	0.07	0.1
Telephone	0.18	0.16	0.17	0.17	0.17	0.2
Miscellaneous	2.14	1.9	1.67	1.5	1.5	1.5
Total expenses	27.9	24.7	24.4	23.01	23.0	23.0
Net profit (loss)	7.7	9.8	10.1	11.5	11.5	11.5

SCHEDULE 6. ESTIMATED INCOME, GROSS MARGIN, AND DEFICITS
(For the First Year of Operations)

Month	Sales	Gross Margin	Expenses	Surplus or (Deficit)	Monthly Cap. Expenditures	Surplus or (Deficit)
1	$ 2,000	$ 690	$ 2,478	($1,788)	$ 1,222	($3,010)
2	4,000	1,380	2,463	(1,083)	1,222	(2,305)
3	6,000	2,070	2,733	(663)	1,222	(1,885)
4	8,000	2,760	2,733	27	1,222	(1,195)
5	10,000	3,450	3,113	337	1,222	(885)
6	12,000	4,140	3,298	842	1,222	(380)
7	14,000	4,830	3,903	927	1,222	(295)
8	16,000	5,520	3,948	1,572	1,222	249
9	18,000	6,210	4,393	1,817	1,222	595
10	20,000	6,900	4,603	2,297	1,222	1,074
11	20,000	6,900	4,603	2,297	1,192	1,106
12	20,000	6,900	4,603	2,297	1,192	1,106
Totals	$150,000	$51,750	$42,871	$8,883	$14,604	($5,825)
			Deficits based on operating expenses:		$3,534	
			Deficits based on operating expenses and capital expenditures (notes):		$9,955	

personnel, pharmacists and others. Other expenses, such as rent, delivery, bad debt, and telephone, also rise in proportion to sales and level off as they approach the standard ratios. Some, such as interest and advertising, diminish. The ratios as of the last month are very comparable to those of the *Lilly Digest*. Partners' salaries remain constant. This is as it should be. The business does not warrant any additional withdrawals, and such might be disastrous if taken. No additional withdrawals can be taken until the close of the second year.

Two other problems require serious consideration. These are: The matter of deficit financing and building up the level of inventory to accommodate the increases in sales.

With regard to deficits: We have seen that initial capital needed merely to open the store was $23,310 and that the partners' available cash was $30,000. This leaves a balance of $6,690. This sum would be used up before the third month of operations, working capital would be wiped out, and there would be three or four months of deficit financing required. A loan must be negotiated as soon as possible. It is suggested that this be done as soon as operations are begun. The question arises, how large should the loan be? There is a total of $9,955 of deficits to be met. The break-even sales volume is not reached until the eighth month. During this period there will be no resources to pay the notes on the loan. It is necessary that the loan be of sufficient magnitude to cover the deficits until adequate surpluses are realized as well as to make monthly payments on the loan. It is recommended that a $15,000 personal loan, payable monthly for three years at 3 per cent, be negotiated. The proceeds and effects of the loan would be as follows:

Loan		$15,000
Less interest at 3%		1,350
Proceeds of the loan		$13,650
Less: deficit financing	$9,955	
Payments on loan, 8½ months	3,083	13,038
Remainder		$ 612
Cash reserves		6,690
Working capital		$ 7,302

We see then that as a result of this loan all normal contingencies will be met and there would remain an amount of working capital adequate for the circumstances. This loan could and should normally be incorporated into the schedules. It is felt, however, that this would tend to complicate the schedules to such an extent that it might be confusing and bewildering to the student and it was, therefore, treated separately.

The other matter requiring serious consideration is that of the inventory. We note from Schedule 4 that by the sixth month the annual turnover ratio exceeds our goal of five. A number of courses are open. A loan could be made to buy more inventory, or additional inventory may be purchased from the wholesaler and the existing loan renegotiated. The other alternative is to wait until funds are available from surpluses to build up the inventory to desired optimum levels. By the ninth month the turnover ratio is about nine, a figure that is high but not excessive. However, during the ninth month $178 becomes available after paying the note on the personal loan; during the tenth month there is $657; by the eleventh month the refrigerator is paid off helping to make $689 available; during the twelfth month a similar amount is available; by the thirteenth month $830 of notes no longer need to be paid, but insurance of $600 must be renewed, releasing only $919; but subsequent to this there is about $1,520 available each month. It is apparent, then, that with careful buying subsequent to the sixth month it is possible to continue operations without difficulty, being assured that funds will become available for inventory purposes and eventually for increasing partners' withdrawals, and our business is on its way.

DISCUSSION

We have traced the steps necessary for making careful determinations of the capital requirements necessary to establish a new drugstore. But we have done much more than merely list the sums involved. We have applied accounting principles in utilizing the standard forms and schedules. We have made determinations of interest requirements, we have determined gross margins, profits, turnover ratios, and other data. As a side issue we could develop balance sheets during various stages of the process and if we so desired we could show how the monthly depreciation of the various fixed assets can be computed.

We have introduced many important terms and concepts. We can explain, define, and elaborate upon their determination, value and uses. Among these are: turnover ratios, operating ratios, break-even points, deficit financing, and many others.

This subject is very well received by the students, who show a great deal of interest in it. Many provocative questions are raised, and the discussion ensues at a lively pace. The background of accounting which our students have helps immensely. We find that about four two-hour sessions are needed to develop the unit thoroughly. All this effort is amply compensated by the general excellence of the reports which are subsequently filed.

REFERENCES

(1) Jeffries, S. B. and Isidore Greenberg, *Am. J. Pharm. Ed.* 20, 215 (1956).

(2) Greenberg, Isidore, *Am. J. Pharm. Ed.* 20, 211 (1956).

(3) *Lilly Digest for 1956* (1957), pp. 34-35.

(4) Greenberg, Isidore, "A Study of the Forces Affecting the Rate of Sales Growth in Retail Pharmacies from the Time of Organization to the First Profitable Stage and the Capital Requirements Needed During this Period." A proposed study. Unpublished.

Thus through act and word, through counsel and deed, the pharmacist in the corner drugstore has the opportunity and I believe the obligation to serve as an educational leader to the community which he serves.

Walter D. Cocking, Am. J. Pharm. Ed., 4, 27 (1940)

THE LEADING OF CASE DISCUSSIONS IN PHARMACY MANAGEMENT*

FLOYD A. GROLLE

The so-called Harvard "case method" was developed as a device to induce students to learn by simulating actual experiences as distinguished from purely memorizing rules and principles.

A case is a record of an actual business situation which has been faced by men in practice with the facts, prejudices, and opinions upon which managerial decisions had to depend. It brings into the classroom a means of placing the student into situations where, as a manager or owner, he must recognize existing problems, evaluate the evidence, and act with responsibility.

No predetermined answers are available to him; but through the discussion of a variety of specific cases involving actual pharmacy situations, the pharmacy student is exposed to types of problems he is likely to face in his later experiences.

With the exclusive textbook-lecture method of teaching there is a tendency to memorize various terms and solutions; whereas, study by the case method demands continual use of terms, and analysis approaches to a point where it may become almost automatic. Generalizations developed from cases do not automatically afford answers to new problems which have a way of not being "typical." Learning how to differentiate one situation from another and how to recognize the more important issues contributes to the development of analytical and administrative capacity. Thus, through a series of such experiences, the student absorbs a background of factual information, methods of attack, rules of procedure, and principles for guidance in changing sets of circumstances.

The case method places the student in a situation where he is faced with a problem to be solved or evaluated and with a possible course of action to be recommended. The responsibility for solutions is placed upon the student rather than upon the instructor. This challenge to the student's ingenuity can be a far more potent and palatable incentive than regimented reading assignments and memorization of specific principles, formulas, and busy-work routines.

The maximum and minimum goals which are implicit in the case methods are stated as follows. The minimum—itself a goal of considerable difficulty to achieve—is an attitude and habit of thought characterized by logical behavior in dealing with problems, such as:

(1) The power to analyze and to master a tangle of circumstances by selecting the important factors from the whole set of facts and by weighing their importance in context. In the eyes of an advocate of the case method this power of analysis is not to be interpreted as the power to derive and apply any "principles" in the sense that once the principles have been applied, the answer will come out mechanically.

(2) The ability to utilize ideas, to test them against the facts of the problem, to throw both ideas and facts into fresh combinations, thus discov-

*Presented to the Section of Teachers of Pharmacy Administration, AACP, Los Angeles, California, 1958.

ering ways which make them appropriate for the solution of the problem at hand.

(3) The ability to recognize a need for new factual material or the need to apply technical skills to a problem, and the ability to assimilate such facts and skills as are needed for the solution of the problem.

(4) The ability to use later experience as a test of the validity of the ideas already obtained, with flexibility to revise goals and procedures as experience is deepened. This is the key to continued learning after formal education ends.

Students who reach the maximum goal will, of course, have the minimum qualities just described. In addition they can be expected to have:

(5) The ability to communicate their thinking to others in a manner which induces thought.

(6) The ability to use ideas in theoretical form, i.e., one should be able to create a coherent structure of generalized propositions from his problem-solving experiences. From this, one should be able to make inferences, both by adding the theoretical ideas of others as they are pertinent, and by one's own thinking on a high level of analysis.

(7) The ability to attain the goal simply, completely, and without any more waste than is necessary in any thinking about an unfamiliar problem.

Today the most commonly used method of teaching pharmacy management is the lecture in conjunction with text assignments. There are certain advantages in this method which are responsible for its wide prevalence in pharmacy teaching. It is commonly thought to be efficient; and it is economical of the time, energy, and patience of the instructor as well as of the student. In addition, it may appear to produce satisfactory results. But we know when we examine the effectiveness of the lecture method by more than superficial tests that the content of the lecture has not made nearly the impression that we think it has.

The type of material presented in pharmacy management courses lends itself to a combination of lecture and case method. Pharmacy management can and should be taught using cases in combination with the lecture method. During the first part of a two-semester sequence, while the students have little knowledge concerning the terminology of the areas involved, approximately half of the time could well be spent using some type of lecture procedure. The other half could be used for analysis of actual cases which have confronted pharmacists in the field. During the second semester the greater portion of the class time could be devoted to the analysis of cases.

Most students seem to derive great benefit from the cases, while a few adjust rather slowly or not at all. The basic equipment which the case method student should possess is not dissimilar to that needed by the lecture student. The mind that can adjust rapidly to a democratic learning process has a number of distinguishing qualities. It must be willing to accept risk. The risk element is present in practically all business decisions. The student must be prepared to take chances. If he is not willing to do this, there is certain to be a great deal of frustration involved in learning by the use of cases.

The instructor's role is considered the most important aspect of a successful case discussion. A discussion is as good as, but no better than, its discussion leader. Several characteristics of the case session make the

discussion leader's role of primary importance. He must be a skillful guide and prodder, rather than an instructor. While refraining from interjecting his own opinion, he must be able to steer the discussion along lines that will be productive. Under these conditions, successful leadership requires a good deal of talent and tact. A great portion of the case method's success or failure depends upon the relation which exists between the instructor and the students. One of the instructor's main concerns, therefore, will be the rapport established with the class. This ultimately depends on the instructor's intelligence, patience, tolerance, and understanding as manifest by his daily behavior.

Since the case method depends upon allowing group members to develop their own principles, the wise instructor avoids taking sides in the discussion.

Some instructors may use the case session as a platform for their own pet theories, but nothing destroys the atmosphere of a discussion more than this.

The value of the case method in changing attitudes without arousing resentment also rests on the tact and patience of the discussion leader. If students are to profit from a case session, they need a permissive atmosphere in which they can put forth their ideas without fear of the instructor's rejection, derision, or blame.

Since the primary aim of the case method is to develop habits of logical thinking, the instructor must be capable of reasoned and logical analysis himself. In order to act as a guide to the subject, he must be able to recognize the central issues and identify the underlying causes of the problem well in advance of the group.

Successful case instructors have found that it is helpful to observe five rules in handling case discussions:

1. The instructor should come adequately prepared.
2. He should remain in the background as much as possible.
3. He should develop a permissive atmosphere.
4. The leader should avoid interjecting his own point of view.
5. He should follow the summary and question technique—that is, summarize what has just been said, and then immediately follow it with another question.

There is a widespread impression that the case method works most effectively with small classes. My experience has been solely with classes under thirty students. During my observations of the case method at the Harvard Business School, there seemed no great problems involved with as many as eighty students. Generally, classes of less than fifteen impose limitations upon active discussion. Before a profitable discussion can be carried out, it has been found at least seven or eight superior students should participate. No sweeping conclusions can be made, or should be, regarding the minimum or maximum size necessary for a rewarding case discussion. The success hinges heavily upon the instructor's skill in handling the personalities participating.

There are numerous ways of opening the case for discussion. The opening technique will vary with the case involved. Study questions are sometimes provided at the end of each case, and therefore these can be a good point of departure for beginning the discussion.

To some the case method may appear to be a lazy instructor's method,

for so much of the procedure is based on questions followed by silent observation. Questioning, however, by one without a thorough background and understanding will result only in muddled discussion. The ill-prepared instructor may be embarrassed by classes presenting an aggregate of more facts than he commands. The case method, then, presents a real challenge to the instructor who is unafraid of hard work. So, it is apparent the instructor must prepare for his role in class.

In preparation for a lecture the instructor organizes his material and determines the order and depth of his presentation, but this does not follow logically under the case method. The reading and rereading of the case is not sufficient. He must be so thoroughly familiar with the case that he is ready to cope with deviations which the discussion may produce, to modify his approach at any time, or suddenly change his outline in line with new ideas which may not previously have occurred to him.

The first step in the instructor's preparation is to master the facts. Written summaries of essential details, outlines and notes in the margin prove to be invaluable during the directing of the discussion.

After completing all the preliminaries, it is suggested the case be reread with the view in mind of capturing an over-all picture of the problem. This is not always possible if the preliminary calculations, marginal notes, and outlines have been completed immediately prior to the final "glimpse" reading. It has been found helpful to allow the preliminaries to "cool off" for a period of time.

The instructor who is using the case method for the first time will have a tendency to hold fast to the prepared teaching outline. Because of this, he has his own conception of how the class discussion should develop. If the discussion does not follow this concept, there is a tendency to begin specific or narrow questioning to again channel the class into his own mold. If this continues, the free exchange of ideas between the class and instructor is greatly blocked, and the stimulating aspects of an ideal case discussion may cease to exist.

Some cases may contain a sizable amount of technical detail. In most instances, enough facts are included to convey the significant data. Oftentimes students ask for an explanation of terms used in the case which are not clear to them. It is desirable if the instructor can anticipate queries of this type and make provision for them by taking steps to become well informed himself.

Do not overlook the chalkboard as an aid to drawing the essentials together. It is useful for listing the pros and cons uncovered by the discussion, or jotting down notes as to important areas for discussion, or developing steps in a program of action to carry out a decision.

The instructor may find it advantageous to develop the habit of jotting down some notes as soon as possible after the end of the class discussion. They may include corrections or clarifications needed in the case, possible change of study questions, new lines of reasoning or different methods of calculation uncovered by the class. They are extremely helpful in preparation for teaching the case for the second time.

It may be in order to mention one or two precautions in the use of the case method. Inexperienced instructors are inclined toward a too literal interpretation of undirected or free student discussion. If an instructor calls

on the first student to raise his hand in response to a question or to an argument presented by another student, it could become evident that practically all the discussions are carried on by only a few members of the class. The other students may avoid possible embarrassment by staying out of the arguments and thereby lose the experience of active participation which the case method is supposed to encourage.

One particularly eager student may attempt to dominate the discussions. He comes to class well prepared and can usually argue down any other students who do not agree with him. He emerges as an unofficial, but, nevertheless, real leader of the course, with the instructor eventually becoming relegated to an unimportant role. The result may stifle active participation by other students just as effectively as if the instructor had dominated the situation with his own opinions and preconceived solutions. Resentment grows among the other students to a point where they may complain to the instructor and propose some rather drastic actions against the overly eager student. This may develop into a real problem in human relations if appropriate early action is not taken. With experience, the instructor will know when it is proper to avoid completely uncontrolled student discussions, and how best to perform his function as a discussion leader by maintaining some reasonable balance of participation by members of the group.

The student should not be permitted to stop with the expression of viewpoints in the discussion of a case. Above all he should not be permitted to express only those viewpoints which are pleasing to the instructor. He must be made to support his viewpoints with sound reasoning. Sound reasoning can be supported only with a thorough knowledge of the facts and principles underlying the problem. Even though the case method is not one in which the primary objective is to learn a succession of facts merely for the sake of learning them, a command of facts, rules, and principles is necessary for reasoning which leads to sound conclusions. Facts, rules, and principles take on significance when they are related to problems under discussion.

It takes time and struggle to reach a stage of thinking to be "case method" minded and to attain faith and conviction in this sort of approach to teaching. It is not a sure-fire way of teaching. It's chief merit is that in confronting a problematic situation the student is guided to find a solution not trivial or bizarre, but mature and reasonable.

In the future we teachers in the area should each develop one or two new cases a year and, as a result, continuously provide new cases available for teaching purposes. I feel the case method carefully coordinated with lectures will become the accepted tool in the future of pharmacy management instruction. You can find the method stimulating.

Idealism is not a thing that is solid, or material, or unchanging. Ideals are like characters and virtues; they need culturing to maintain their stature.

Thomas W. Murrell, Am. J. Pharm. Ed., 4, 367 (1940)

REPORT OF THE DELEGATE TO THE AMERICAN PHARMACEUTICAL ASSOCIATION HOUSE OF DELEGATES ANNUAL MEETING, 1958

The regular meeting of the House of Delegates was held in Los Angeles concurrently with the 105th annual convention of the American Pharmaceutical Association.

Dr. Stephen Wilson, Chairman of the Committee on Social and Economic Relations, reported further on the *Manpower Situation* as a sequel to his report at the First Interim Meeting, November, 1956 (1). At that time he stated that the number of people from twenty to twenty-four years of age — the ages at which most students graduate, complete the internship, and pass the board — will be 3 per cent less in 1960 than in 1940. At the Los Angeles meeting Dr. Wilson stated that this shortage, as compared with 1940, has actually existed for two or more years. This he concludes "accounted for the drop in graduates from colleges of pharmacy and for the difficulties which recruitment has encountered."

On the brighter side, information given showed that in 1965 the twenty to twenty-four age group will have increased approximately 17 per cent over the number in 1940. Too, in the fifteen-nineteen age bracket, the senior high school age group, the number in 1965 will be about 40 per cent greater than the number in 1940.

Chairman Wilson stated that in spite of the large increase in our population, the labor force, in relationship to the total population, will remain about constant through 1975. "This continued shortage in the labor force," he said, "means active continuation of recruitment programs in virtually all fields, and makes it more mandatory than ever that pharmacy have an actively stepped-up recruitment program in operation as soon as possible. If this is not done, pharmacy will not get its needed share of the increased numbers."

By 1975, the shortage will be in the forty to fifty year age group. In view of this, salaries and long-term incentives should be considered in order to encourage lifetime careers in the profession for employee pharmacists.

Other information presented showed that the number of pharmacists in practice in 1957 is essentially the same as that for 1956. Based on a pharmacist-population factor of 0.067 per cent, this leveling off of the number of pharmacists in practice indicates that the shortage of pharmacists increased at least threefold and possibly fourfold in a single year.

This information, when considered with the anticipated number of graduates through 1961, caused Chairman Wilson to conclude ". . . a recruitment program is urgently needed and unless it is carried on assiduously at the junior college level as well as at the high school level there can be no improvement in the situation before 1961. As a matter of fact, the indications are all in the direction that, bad as the situation is now, it will get worse before it gets better."

Lyman D. Fonda, Chairman, Committee on Student Branches, stated that the membership of students in the A.Ph.A. is continuing at a satisfactory level in view of the decreased enrollment and the advent of prepharmacy programs. As of January 1, 1958, there were 12,630 members, about 200 less than at the same date in 1957 and 300 less than for January 1, 1956.

He reported that the *Three-Year Pledge Plan* is showing an increase in both the number of seniors becoming members and the percentage of those contacted accepting membership. In 1957, 3,273 seniors were contacted and 71 per cent (2,317) returned pledges.

Reporting for the Committee on the Status of Pharmacists in Government Service, Chairman F. Royce Franzoni had this to say about opportunities for pharmacists in the various branches of the Services.

The Army. Career opportunities are still open in the Army Medical Service Corps for graduate pharmacists, either in the Regular Army or in the Reserve Component. A pharmacy graduate with a master's degree, or with a B.Sc. and three years practical experience in pharmacy may apply for a direct commission in the MSC of the Regular Army. A senior in a recognized pharmacy school may also apply for the Regular service and try for a commission. Seniors in recognized schools, and graduate registered pharmacists may apply for a Reserve commission — with a concurrent call to active duty for a period of three years. This three-year active duty, as a Reserve officer, will satisfy Selective Service obligation.

The Air Force. Any pharmacist who desires to compete for a Regular commission must enter the service as a Reserve officer to be eligible to apply for a Regular appointment. Graduate, licensed pharmacists who desire to apply for a Reserve commission, with concurrent active duty for a minimum period of three (3) years, must be citizens, of good moral character, physically and professionally qualified, and at least eighteen years of age. They must also have a B.Sc. in Pharmacy and a license to practice pharmacy. Appointment is made on a competitive basis when actual vacancies exist. Pharmacists interested in Air Force service may obtain additional, detailed information and appropriate application kits by writing to the Office of the Surgeon General, Headquarters, US Air Force (Attention: AFCSG-25.1), Washington 25, D.C.

The Public Health Service. For the most part, vacancies in the Service are filled through the intern program. Seven (7) one-year internships are offered annually to graduates of Class "A" Schools of Pharmacy, through their deans. Seventy-one (71) applications were received for the July 1958 internships, from thirty-five (35) Class "A" Schools. Seven interns and fourteen alternates were selected. Alternates not receiving intern appointments, as openings occur during the year, are offered staff appointments in the grade of Jr. Asst. Pharmacist and, like the interns, are considered as career officers.

Copies of a brochure *Pharmacy Internships in the Hospitals of the Public Health Service* are available by writing to the Chief, Pharmacy Branch, Division of Hospitals, US Public Health Service, Washington 25, D.C.

The Veterans Administration. This year, a larger number of residencies leading toward the master of science degree in hospital pharmacy is offered by the VA and cooperating universities, and a total of twelve are now in effect to meet the need for pharmacists with specialized hospital pharmacy training to fill full-time key positions in the VA hospital system. Cooperating in this residency training are the graduate schools of the University of Southern California, State University of Iowa, St. Louis College of Pharmacy, University of Buffalo, Butler University, University of Pittsburgh and the Philadelphia College of Pharmacy and Science. Participating VA hospitals are

in Los Angeles, Iowa City, St. Louis, and Buffalo — with VA hospitals in Indianapolis, Pittsburgh, and Philadelphia offering the program, commencing in September 1958.

Information on pharmacy positions in the VA and how to apply may be obtained from Mr. Vernon O. Trygstad, Director, Pharmacy Service, Veterans Administration, Washington 25, D.C.

The following resolutions, believed to be of interest to educators, are presented together with the action of the House of Delegates and of the A.Ph.A. Council (2):

Student Recruitment. 1. President Burt recommended in his presidential address that the American Pharmaceutical Association go on record as recognizing the important responsibility of the individual practicing pharmacist, in all segments of pharmacy, in the recruitment of well-qualified students of pharmacy, and that the Association urge each of its members to lend his personal assistance to this effort in order that our future manpower requirements may be met.

The House of Delegates approved this recommendation, and the Council directed the Secretary to publicize this recommendation.

2. *Whereas,* any profession must improve or become obsolete, and

Whereas, the quality of the group is determined by the quality of its individual members, be it

Resolved, that an effort be made to attract intelligent, industrious young people to study pharmacy and be it further

Resolved, that, in order to accomplish this, the vocational counselors of all high schools be furnished all pertinent information concerning the opportunities, responsibilities, and the rewards in the profession of pharmacy.

The House of Delegates voted to refer the resolution to the American Association of Colleges of Pharmacy. The Council requested the Secretary to enlist the aid of the American Association of Colleges of Pharmacy in its implementation.

3. *Whereas,* pharmacy, in many cases, is left off the recommended list of professions by vocational guidance directors for the top 10 per cent of high school graduating seniors and those that show they are of college caliber and are capable of doing satisfactory college work by receiving a favorable grade on such tests as Ohio State University's Psychological Examination, be it

Resolved, that the American Pharmaceutical Association enlist the aid of the American Foundation for Pharmaceutical Education and the companies sponsoring the booklet, *I'll Take Pharmacy,* to obtain the names of these highly intelligent and qualified high school graduates for transmission to the deans of the colleges of pharmacy throughout the country so that pharmacy will be given an equal opportunity to present its case.

The House of Delegates voted to refer the resolution to the American Association of Colleges of Pharmacy. The Council requested the Secretary to enlist the aid of the American Association of Colleges of Pharmacy in its implementation.

4. *Whereas,* the high schools of the nation actively support science clubs, and

Whereas, the high school science teachers also have their science organizations which actively sponsor the National Science Fair, and

Whereas, manufacturers, clubs, organizations, and the AMA encourage these Science Fairs by awarding prizes, be it

Resolved that the American Pharmaceutical Association go on record as approving the National Science Fair and make it possible to offer a prize for the best project in the field of pharmacy.

Since this resolution requires an expenditure of funds, the House of Delegates voted that it be referred to the Council for further consideration. The Council approved the resolution in principle and requested the Secretary to ascertain what other professional organizations are doing in this field and refer the resolution and further information to the Committee on Finance.

Membership Qualifications. *Whereas,* in accordance with the present Constitution and Bylaws, it is possible for those having no professional or academic qualifications to become active members of the American Pharmaceutical Association, and

Whereas, this is inconsistent with the nature and composition of the membership of a learned professional organization and contrary to the interests of a public health profession, be it

Resolved, that the Committee on Constitution and Bylaws be directed to prepare and submit for action by the Association the necessary changes in the Constitution and Bylaws that will restrict future active membership to those who are either licensed or graduate pharmacists or have an equivalent academic training in one of the physical or biologic sciences supporting pharmacy. Those not meeting these qualifications would be made eligible, at the discretion of the Council, for an affiliate membership but could not vote or hold office. It is understood that such changes in the qualifications for membership shall not be retroactive.

The House of Delegates approved the resolution and recommended that it be referred to the Committee on Constitution and Bylaws for implementation. The Council requested the Secretary to refer the resolution to the Committee on Constitution and Bylaws.

A.Ph.A. Student Branches. 1. *Resolved,* that, in addition to the current section devoted to Student Branch news in the *Practical Pharmacy Edition* of the *Journal of the American Pharmaceutical Association,* one or two additional pages be allocated to contributions by students on subjects of national interest concerning pharmacy and public health.

The House of Delegates recommended that this resolution be referred to the Committee on Publications of the Council of the American Pharmaceutical Association. The Council referred the resolution to the Committee on Publications for action.

2. *Resolved,* that a Certificate of Merit be presented at each annual meeting of the Student Section to those Student Branches in which 100 per cent of the graduating class has indicated participation in the Three-Year Membership Plan and be it further

Resolved, that the faculty adviser of each Student Branch so qualifying shall receive a letter of commendation signed by the President and the Secretary of the Association.

The House of Delegates approved the resolution. The Council requested the Secretary to take the necessary steps to implement this resolution.

Time of Meeting. *Resolved,* that the Council of the American Pharmaceutical Association reconsider the question of the time of holding the annual convention and further consider the holding of the convention in the late summer or early fall to the end that it may be possible for more college men and teachers as well as State Association officials to attend the convention, for, under the present plan of holding the annual convention in the spring, school officials are busy with school matters and State Association officials, especially secretaries and members of legislative committees, are busy with legislative matters affecting their respective states.

The House of Delegates referred the resolution to the Committee on Place of Meeting for further study. The Council requested the Secretary to refer the resolution to the Committee on Place of Meeting with the request that it submit its report on the resolution to the Council as soon as possible.

Public Relations. Chairman Gesoalde recommended in his address to the House of Delegates that a public relations program for retail pharmacy, hospital pharmacy, and colleges of pharmacy be set up and the Committee on Resolutions urged that the Committee on Public Relations give this matter careful study.

The House of Delegates approved the recommendation. The Council requested the Secretary to ask the Committee on Public Relations to take early action on this recommendation.

Charles W. Bliven, Delegate

REFERENCES

(1) *J.A.Ph.A., Prac. Ed.* 18, 33 (1957).
(2) *J.A.Ph.A., Prac. Ed.* 18, 416 (1957).

If then the individual pharmacists of America are to assume their full responsibility to serve as educators and counselors of the individuals whom they contact, it becomes the obligation of the teachers of pharmacy to so influence their students that they will go into the profession with a full comprehension of their duty to teach.

Robert C. Wilson, Am. J. Pharm. Ed., 4, 42 (1940)

REPORT OF THE SECRETARY-TREASURER OF THE AACP CONFERENCE OF TEACHERS 1957-1958

In the short span of six years since its inception, the Conference of Teachers of the American Association of Colleges of Pharmacy has grown, until today its membership numbers 348 active members. Completing the first year of a three year term as Secretary-Treasurer of the Conference of Teachers has been an enjoyable and exhausting experience. To name all of those who have made this first year in office a pleasant one would require reading the membership list; however, there are those who have contributed more than their share.

It is doubtful if all of us recognize the tremendous contributions that my predecessor has made to this organization, and I, above all, am indebted to Edward P. Claus for his ever-readiness to share with me his experience of six years in this office. The leadership of Chairman Paul J. Jannke is well exemplified in the reports and further illustrated by the most successful year the Conference of Teachers has ever enjoyed. The Conference is especially indebted to Lloyd M. Parks and Ewart A. Swinyard for the fine program which has been presented here today. The Bylaw Committee has had a tedious task. A. A. Dodge, Heber Youngken, Jr., and Edward J. Rowe have done a splendid job, and the Bylaws should be in print in the very near future.

Credit for our increasing membership is due to the Membership Committee of the various Sections. This office received approximately twenty applications for membership that originated from the office of Esther J. W. Hall. If the Membership Committees of each Section would use some means of identifying the membership blanks they send out, this office is sure credit could be given to others. Approximately 500 pieces of mail were sent from this office during the period April 23, 1957-April 1, 1958. All those holding membership for the year 1956-57 were contacted for renewal membership, and the deans were contacted for their support. In an attempt to stimulate greater interest in the *American Journal of Pharmaceutical Education* a message was included with all renewal applications. The results of the contact with the deans enable this office for the first time to list on "The Honor Roll for 1957-58" seven colleges of pharmacy in which all full-time faculty members hold membership in at least one of the Sections of Teachers. These colleges are: Drake University, University of Florida, Loyola University, University of Michigan, University of Minnesota, University of Mississippi, and Southern College of Pharmacy.

The Council on Conference of Teachers for the year 1957-58 is composed of the following:

Representative, Section of Pharmacy Administration
Ralph J. Mill (1958)
Representative, Section of Biological Sciences
Frank Mercer (1959)
Representative, Section of Pharmaceutical Chemistry
Paul J. Jannke (1959)
Representative, Section of Pharmacy
E. E. Leuallen (1958)
Representative, Section of Graduate Instruction
Takeru Higuchi (1959)
Representative appointed by AACP

At the second session of its annual meeting held in New York City, 1957, the Council elected the following officers:

Chairman, Paul J. Jannke

Vice-Chairman, Takeru Higuchi

Secretary-Treasurer, Joseph H. Kern (1960)

The report of the Conference Membership Committee and the Membership List for 1957-58 will bring you up to date on the composition and distribution of our membership. In the future each member will receive two membership application blanks, one for the member's own use and the other for a colleague who has not taken advantage of our association.

When all full-time faculty members of a college or school of pharmacy hold membership in one of the Sections and a letter attesting to this fact is received from the office of the dean, this office will enter the name of that school upon "The Honor Roll" for that year.

Your attention is directed to Article IV, Membership, Section 1. Members., of the Bylaws. "Any active member of the Conference in good standing who reaches retirement status shall be designated as an *emeritus* member of the Conference, without payment of further dues." Please notify your Section officers or this office if you know of anyone that is eligible.

The Conference of Teachers is again indebted to the AACP Executive Committee for its continued generous financial support of this office. Louis C. Zopf and George Webster have been most cooperative and helpful.

I sincerely hope that the conduct of this office has your approval. The mistakes are mine, the credit yours. Many thanks for your fine support. Your officers are counting on you for a bigger and better Conference of Teachers for the year 1958-1959.

CONFERENCE OF TEACHERS

AMERICAN ASSOCIATION OF COLLEGES OF PHARMACY

Treasurer's Report

April 1, 1958

Section of Teachers of Pharmacy Administration

Balance Brought Forward	$ 150.78		
Dues Collected	84.00		
Total		$ 234.78	
One-Fifth of Dues to Section of Graduate Instruction	$ 16.80		
Section Expenses	10.43		
Total Expenses		27.23	
Balance			$ 207.55

Section of Teachers of Biological Sciences

Balance Brought Forward	$ 316.80		
Dues Collected	89.00		
Total		$ 405.80	
One-Fifth of Dues to Section of Graduate Instruction	$ 17.80		
Section Expenses	28.30		
Total Expenses		$ 46.10	
Balance			$ 359.70

Section of Teachers of Pharmaceutical Chemistry

Balance Brought Forward	$ 284.60		
Dues Collected	94.00		
Total		$ 378.60	
One-Fifth of Dues to Section of Graduate Instruction	$ 18.80		
Total Expenses		18.80	
Balance			$ 359.80

Section of Teachers of Pharmacy

Balance Brought Forward	$ 412.43		
Dues Collected	119.00		
Total		$ 531.43	
One-Fifth of Dues to Section of Graduate Instruction	$ 23.80		
Total Expenses		23.80	
Balance			$ 507.63

Section of Teachers of Graduate Instruction

Balance Brought Forward	$ 308.05		
One-Fifth Dues from Sections	77.20		
Total		$ 385.25	
Balance			$ 385.25
Miscellaneous Income	$ 7.77		
Total		7.77	
Balance			$ 7.77
TOTAL BALANCE			$1827.70

Summary

Balance of Sections as of April 1, 1958

Section of Teachers of Pharmacy Administration	$ 207.55	
Section of Teachers of Biological Sciences	359.70	
Section of Teachers of Pharmaceutical Chemistry	359.80	
Section of Teachers of Pharmacy	507.63	
Section of Teachers of Graduate Instruction	385.25	
Miscellaneous Income (Interest & Fees)	7.77	
Total Conference Treasury		$1827.70

The total Conference treasury of $1827.70 is maintained as follows:

Citizens Bank of Gainesville, Gainesville, Florida		
Checking Account	$ 984.49	
Savings Account	800.00	
Accounts Receivable (Office Conference Sec.-Treas.)	43.21	
Total Conference Treasury		$1827.70

April 1, 1958

Expenses of Secretary-Treasurer
For the Period
April 23, 1957 - April 1, 1958

Balance Brought Forward	$ 7.72		
From AACP	50.00		
Total Income		$ 57.72	
Postage	$ 19.61		
Freight	8.95		
Office Supplies	57.43		
Printing	9.78		
Bank Service Charge	2.58		
Total Expenses		98.35	
Deficit			$ 40.63
Petty Cash Fund	$ 2.54		
Deficit	40.63		
Total		$ 43.21*	

* The total of $43.21 is an account payable, listed in the Conference Treasurer's Report as Accounts Receivable.

I hereby certify that the expenses listed above, totaling $98.35 were incurred during the period April 23, 1957 - April 1, 1958, in conducting the business of the Conference of Teachers of the American Association of Colleges of Pharmacy.
April 1, 1958

Joseph H. Kern, Secretary-Treasurer
Conference of Teachers, AACP

If it is to progress and assume its proper place, pharmacy must be dignified in the minds of the public and this process must begin on the campus where pharmacy is taught.

Robert C. Wilson, Am. J. Pharm. Ed., 4, 44 (1940)

PRESIDENT'S SECTION . . . . . .

Pharmacy has a heritage of which we may be proud. We will recall that pharmacy and medicine were so closely related that they were virtually indistinguishable in their early history. In the beginning, both medicine and pharmacy were so closely interwoven with superstition that it is difficult to separate the real from the mythical. It would be well for all pharmacists to read or review *The History of Pharmacy* by Kremers and Urdang in order to re-orient themselves in the revolution which took place as medicine and pharmacy became individual professional entities.

It would be especially helpful if all pharmacists would but review the history of American pharmacy. Notable steps in the development of American pharmacy are the establishment of our colleges of pharmacy (the foundation of future pharmacy in America), the discoveries by many illustrious persons, so well known they need not be repeated here, and the establishment of pharmaceutical associations designed to speak authoritatively for the profession. We must be careful not to be presumptuous and overly boastful when we speak of our achievements referring to pharmaceutical progress of the first half of the twentieth century. True, substantial gains and changes have been made by pharmacy, but certain aspects of pharmacy's progress accrued because of advances in theoretical and applied chemistry, in physics, and through the evolution of the biological sciences. These changes in the basic sciences have had a strengthening impact on the development of the profession of pharmacy. Certainly we are far from the zenith of professional achievement; however, we must not fail to recognize the tremendous challenge of the current era. Maybe we should modify our approach and say American pharmacy has been alert and has implemented the findings of scientific data to its professional progress.

Improvement in pharmaceutical product design has resulted from a better understanding of the physical and chemical principles of pharmaceutical applications and through the availability of new and improved agents which lend themselves to the building of therapeutic things. The first half of the twentieth century challenged many established ideas regarding medicinal values. Natural products because of their predominance in therapy were particularly vulnerable to review resulting in a deletion of many of the galenicals as representative dosage forms. Improved extraction materials and expanded scientific methods encouraged isolation of active constituents in pure form. As plant constituents became available as chemical entities, they were studied as to structure and several reappeared as synthetic materials.

In addition to chemical analysis, pharmaceutical products are now evaluated by their physical and biochemical responses. We have available, in addition to many new materials, a multiplicity of instruments and electronic devices with which we can measure and otherwise evaluate purity, potency, clarity, taste, and color as well as predicting physiological responses. Chemotherapy and the application of physical principles to pharmaceutical problems have been instrumental in replacing the old empirical formulas with new and exacting pharmaceutical preparations.

Pharmacy has a new and changing professional responsibility brought about by the implementation of new scientific concepts. We have crossed a threshold where the pharmaceutical and therapeutic products have a superior design and improved therapeutic value as compared with the early galenical preparations. Approximately 450 new drug products are released to the market each year, and although we agree not all of these are new agents, it remains the responsibility of the pharmacists to delineate the therapeutic copies from original or new therapeutic dosage forms.

Exactness in compounding is no less valuable than before, although the demand for this service is reduced due to availability of many prefabricated, standardized preparations. Old pharmaceutical preparations, some of doubtful purity, many of questionable value, are reappearing in modified forms as products of known chemical composition and therapeutic usefulness. For example, curare was known to the pharmaceutical and medical profession for years, and, although it was understood and respected for its toxicity, it did not become a substance of clinical interest until it was possible to isolate the active constituent from its parent source in a highly purified form. Isolation, identification, and knowledge of the chemical structure have brought about several compounds of similar chemical design with equivalent and/or superior physiologic activity. The pharmacist is a consultant in drug therapy, and it is his responsibility to be thoroughly conversant and completely informed regarding the composition and use as well as potential toxicity of all drug products.

The transition from empiricism to scientific application to all things pharmaceutical requires publicity. Pharmaceutical education must sell its program of expanded education for students in pharmacy. It is embarrassing and annoying to learn that many of our professional colleagues in the health profession as well as a large percentage of university and college administrators are totally uninformed about the design and the objective of the new pharmaceutical curriculum. It is still more humiliating to hear pharmacists criticize and question the need for expansion and modification of the curriculum. Pharmaceutical education must expand its efforts and disseminate accurate information regarding the new curriculum for the training of future graduates. We assume that others—the laity, the press, other professions—understand and are willing and even anxious to accept our modifications without knowledge as to the soundness of our program. The president of a leading university recently asked the question, why the expanded educational program for pharmacy? We cannot force a historical resumé of pharmacy upon everyone, but most certainly pharmaceutical educators must exert every effort to inform their own associates regarding the new educational matrix.

Pharmaceutical educators are expected to know the background for the present educational expansion. We have the benefit of the results and guidance of the recommendations from the report of the Pharmaceutical Survey. During the period of curriculum revision, we as educators were so concerned with the detail of course sequence and syllabi that we neglected to inform those disciplines of pharmacy not immediately responsible for pharmacy's education. Unfortunately, certain of our colleagues have been permitted to obtain information through hearsay which has established misunderstandings and given reason for some concern. Pharmacy as a

profession will not advance beyond its educational qualifications, and in this it is not at all unique. Society judges us by our abilities, our skills, our social status (the company we keep), and these are dependent upon the individual's intellectual competency.

Medicine, dentistry, veterinary medicine, nursing, and pharmacy share the problem of determining the best design for their respective professional curricula. Each professional group must evaluate and determine the requisites for those who will practice the profession in the future. The volume of new materials necessitates critical and considered judgment before replacement of old ideas and theories or prior to accepting additional material to an already overcrowded program.

It is pharmaceutical education's responsibility to select, cull, and sort all the offerings and to decide which of the new ideas are necessary for our own professional program. It is our obligation to design an educational pattern which will assure the public that future pharmacists will have the abilities and skills necessary to cope with the ever-changing ideas and concepts in the expanding health fields. We must assume our responsibility with an open mind, consider suggestions, and be prepared for critical evaluations and then proceed to select on the basis of our projection of the future needs for pharmacy.

Explaining the new pharmaceutical educational pattern can be done with ease if we have a thorough understanding of the objectives. These can be readily reviewed by reference to the reports of our curriculum committee, and for further documentation we can call upon the recommendations of the pharmaceutical survey. Each specialized branch of pharmacy needs knowledge of our program to serve as a key to a better understanding of our problems. It is unnecessary at this time to emphasize the cardinal points of pharmacy's expanded program, but it is essential that as educators we take every opportunity to explain the program to others who have an association with us in the health fields, and it is particularly important that we give further information to those of our colleagues who are associated with us in the field of higher education.

Louis C. Zopf

The fact that pharmacists do rank high in regard to character is due to fortunate accident rather than to any definite program on the part of pharmacists in the profession, either now or in the past.

Clark T. Eidsmoe, Am. J. Pharm. Ed., 4, 88 (1940)

EDITORIAL

As I write this, campuses all over the country are preparing for the reflux of myriads of students. As you read this, classes will have been formed and the students will have begun once again to classify themselves into the inept, the apt, and the superior. The inept we shall eliminate, the apt we shall teach, but for the superior we shall reserve a special treatment—we shall *shortchange* them!

The failure in American education today to cope intelligently with the more gifted student is a tragedy which is receiving increased attention. It is time that we in pharmaceutical education recognize the necessity of differentiating between *equal* educational opportunities for all and *identical* opportunities for all, for the future intelligent leadership of the profession depends upon that distinction. The neglect of potentially outstanding minds is a luxury we can no longer afford.

As the recruitment of students for pharmacy gains momentum all over the country in the years to come, we must continually bear in mind the necessity of recruiting for quality. "Quality" students will be looking for more than an eventually good salary, for more than a professional title, *and* for more than an average education. We must be prepared with more than an average program: we must be in a position to present challenging educational opportunities and stimulation for the superior student.

In every class of every school are students who have those excelling qualities which set them apart from their fellow students. These students are the potentially creative and scholarly leaders who will shape the pharmacy of tomorrow. But because of the short-sighted vision of pharmaceutical educators, these students are not being stimulated to the broad fulfillment of their human potential. We fail to match academic endeavors to individual capacity, and as a result the superior student is caught in the lockstep of mediocrity paced by the average student in the average curriculum.

Our challenge is stated succinctly by Dean Blair Stewart of Oberlin College:

> The first, and most crucial, question facing the colleges is the gap between the actual performance of their students and the level of educational achievement of which many of them are capable. Too few of our students, even in the best colleges, find an intellectual environment that continuously challenges them to the limit of their abilities.

Superior students by adjusting to mediocrity are environmentally produced "retarded students." The serious ramifications of the problem are made even more poignant by Karen Horney in *The Neurotic Personality of Our Time*:

> Not only is society the loser when a large segment of its most able members does not make the unique contributions of which it is capable, but the individual loses as well. Failing to live up to one's potential prevents the individual from attaining the self-fulfillment, the self-actualization of which he is capable, and thus prevents his becoming a truly integrated person. Some psychologists have viewed the discrepancy between potential ability and level of functioning in our culture as a major symptom of the neurotic personality.

Superior students must be first identified and then given intellectual supervision and intellectual stimulation by the best members of the faculty. The identification of such students is usually easy. Counseling center test results and academic achievement may be used as preliminary guideposts. (One should re-

member that such guideposts are occasionally somewhat misleading.) In a bulletin of the Los Angeles City School Districts, the following points are listed as criteria to identify a superior student:

I. He recognizes a problem and defines it clearly.
II. He thinks in terms of the whole and sees parts in relationship to the whole.
III. He gathers and studies facts about a problem, distinguishing between fact, opinion, and propaganda.
IV. He learns to use sources of information effectively.
V. He weighs evidence, makes inferences, and draws conclusions.
VI. He checks his conclusions for accuracy, modifying his thinking as the evidence dictates.
VII. He detects within himself and tries to overcome such things as subjectivity, rationalization, projection, and prejudice, which inhibit effective thinking.
VIII. He does creative thinking, such as using the imagination, uniting the thinking of a group to form a new concept.

Once the superior student is identified, it is our responsibility to challenge him in an atmosphere that is scholastically rigorous. Such an atmosphere must be based upon a definite program that has definite goals:

I. To build a sound liberal foundation to bolster the specialized bulwark of high-level educational attainments;
II. To stimulate critical thinking and the scientific approach to problem solving;
III. To foster self-stimulation and direction;
IV. To nurture an appreciation of the profession;
V. To motivate the desire to meet intellectual challenges.

How can we in pharmaceutical education achieve these goals? The most important part of the program is a nucleus of faculty members on each college staff who enjoy the academic respect of the superior student, who at the same time want to assume in full seriousness the responsibilities of creating intellectual restlessness in the superior student, and who, once the restlessness is motivated, enrich and intensify the intellectual adventure of learning by developing the students' special talents and aptitudes for every kind of leadership and scholarly achievement in programs that are as unstereotyped and as individualized as possible. Such programs require the faculty's extensive counseling, juggling of courses, waiving of courses, scheduling of additional courses, assignment of special projects, and above all, personal attention, interest, and enthusiasm.

The separation of the superior student from his less gifted classmates should be done without hesitation. Although this need not be a physical separation, special attention and privileges accorded him should not be secreted. Outstandingly high scholarly capacity should be given a position of privilege in a scholarly community.

American college students take for granted the selection of outstanding football players to represent them on the gridiron. Thousands turn out on Saturdays to cheer on the chosen few. It is time that colleges placed their pride in the chosen few who are intelligently superior rather than in those who play games on the grass. There is a great need for the restoration of the dignity of learning.

Individual attention to the superior student will not be an easy goal to attain. Most faculties of pharmacy are woefully understaffed. But the start must be made. In our American academic environment we achieve extensive individual instruction in only two areas: athletics and music. When a college administration

can see fit to provide a fleet of at least a half dozen coaches and assistants to put eleven men on the football field as well as see fit to provide countless special privileges of food, lodging, tutoring, and unmentionable services and comforts; when it can provide semi-weekly individual saxophone lessons to students studying music, surely it must realize the ridiculous position of denying more faculty for individual guidance to the intellectually superior in science courses.

Also there is no excuse for a pharmacy faculty's not attempting to encourage the superior student to be aware of his abilities, not making him capable of evaluating his interests, and not providing the kinds of stimulation that will increase his motivation to achieve.

The State College of Washington School of Pharmacy is making an interesting experiment in an enrichment program for superior students. It is a small step, but a step in the right direction. Under the sponsorship of Rho Chi, an Honors Seminar has been established. Students in their last three years of college who are of high scholastic attainment or who by recommendation of the faculty seem to have the qualities of superior intellect—some may be "late-bloomers" or "under-achievers"—are invited to attend and participate in monthly seminars. The word *seminar* is a dull word in some institutions and is often synonymous with a monologue on an isolated fact of learning with one-sided discussion and little interest. The Honors Seminar, fashioned after the Great Books discussion groups, provides for and encourages mutual participation of all. Subjects are chosen which have aspects about which all who are present have at least partial knowledge. References to background material are made available to the participants well in advance. The discussion group is informal and held outside a classroom building in an informal setting, where coffee is often served. The discussion is a free give and take. As regards the subject under discussion, the known is discussed, the unknown is projected, and the future contemplated. Discussants are led out, guided, and stimulated. Facts are learned by independent study on an individual basis, thoughts are coordinated, imagination stimulated, and verbal expression sharpened. The excitement of developing a searching, inquiring attitude and meeting the intellectual challenges is a refreshing experience for any superior student. The ability to create such an atmosphere is a gratifying challenge to any faculty member. Although the Honors Seminar is too new to be evaluated conclusively at this time, its success is without question dependent upon the careful planning of the faculty in charge.

But no matter what form the program for the superior student takes, the necessity of its existence should not be questioned. Society has the right to receive from each person those contributions which are in accordance with his maximum potential, and, therefore, that society through us as educators should strive to provide as much appropriate education as possible to effect this end.

Melvin R. Gibson

Success depends in no small measure upon the quality of thinking which must be constructive as compared to negative, fearful and non-productive thinking.

Robert A. Hardt, Am. J. Pharm. Ed., 4, 558 (1940)

MEMORIALS

CYRUS L. COX

Cyrus L. Cox, professor emeritus of Pharmacy at Rutgers University College of Pharmacy, died at his home in Newark on June 24, 1958.

Professor Cox had retired from Rutgers in 1955 after twenty-seven years of service on its pharmacy faculty. Previously, he had taught at his alma mater, Valparaiso University in Indiana for ten years. He had obtained his B.S. and Ph.D. degrees there, after receiving his first pharmacy degree in 1909 from Northwest State Normal School in Oklahoma.

Professor Cox had practiced pharmacy in Indiana from 1909 to 1918 and was also registered as a pharmacist in New Jersey. He brought to the classroom a wealth of practical experience which he shared with a generation of students and some of their children.

Professor Cox made many contributions to pharmaceutical research, particularly in the field of emulsions. He was the author of numerous publications and was well known for his work in the development of bentonite and other suspending agents still widely used today in pharmaceutical, cosmetic, and food technology.

In his long career as a teacher, Professor Cox gained the respect and affection of countless students. Their deep regard for him was obvious from the zest with which they recalled his classes. Every old graduate seemed to be able to quote verbatim his stories and sayings.

But Professor Cox was more than merely "popular." What his students felt for him did not stem only from their delight in his homely anecdotes and flashes of wit. For they paid him the ultimate compliment—they retained his teachings and made his precepts part of their own professional philosophies.

This most sincere of tributes to a teacher may have been his students' unconscious way of honoring a modest man who shunned all other honors. It may be that they sensed in him a quality rare in our culture—peace of soul. And the tenacity with which his instruction was retained may reflect a natural response to a man of mature wisdom and obvious good will.

Professor Cox was born in Farmer City, Illinois, in 1888. He is survived by his wife, Mrs. Estella Morris Cox; five daughters, Mrs. Marianna Sweeney, Mrs. Catharine Flynn, Mrs. Geneva Detweiler, Mrs. Betty Jo Smith—all of Newark, N.J.; and Mrs. Margot Froats of Los Angeles; and ten grandchildren.

Morton J. Rodman

HORATIO C. WOOD, JR.

Dr. Horatio C. Wood, Jr., who for three decades was a member of the faculty of the Philadelphia College of Pharmacy and Science until his retirement in 1950, died March 31, 1958, in the Pennsylvania Hospital in Philadelphia. He had also been a member of the staff of that hospital as professor of internal medicine and pharmacology for many years. At the time of his death he was eighty-four years of age and still resided at 319 S. 41st Street, a few squares

from the College. He left behind him a loyal wife, much interested in the Women's Club of the College, a daughter, and a son, the latter a well-known practicing physician.

He was emeritus professor of pharmacology at the Philadelphia College of Pharmacy and Science and at the same time was emeritus professor of pharmacology and therapeutics of the University of Pennsylvania. He had been editor of the *United States Dispensatory* from 1918 through 1943 and was a veritable compendium of information on matters therapeutic and pharmaceutic.

The Wood family had a colonial background and were consistently pioneers in the field of medicine. Dr. Wood's father, Horatio C. Wood, was the acknowledged leader in internal medicine in all of America.

Someone volunteered the information recently that in the past 100 years there have been eleven members of the Wood family active in the practice of medicine in Philadelphia.

Dr. Wood was a great nature lover, and anyone who had the privilege of accompanying him on a Sunday walk in the woods of Fairmount Park came home a better man—better informed and better motivated spiritually.

He was a gentleman in every sense of the word, gentle in his attitude and gentle in his manners.

Thousands of alumni and former students mourn his going home.

Ivor Griffith

GEORGE EDWARD CROSSEN

Pharmaceutical education and the profession of pharmacy have lost a person dedicated to the elevation of his profession. Dr. George E. Crossen, Dean of the School of Pharmacy of Oregon State College for thirteen years, died suddenly on June 28, 1958, at Corvallis, Oregon.

George Edward Crossen was born on July 21, 1905, at St. Paul, Minnesota. He earned his way through high school and college by working as a drug clerk in the Minneapolis-St. Paul area. He received his B.S. from the University of Minnesota in 1933. He was employed by his alma mater as an instructor of pharmacy while working towards higher degrees. He received the M.S. degree in 1937 and the Ph.D. degree in pharmaceutical chemistry in 1940 from Minnesota.

He served as assistant professor of pharmaceutical chemistry at Minnesota from 1940 to 1942, and as dean and professor of pharmacy at Drake University from 1942 until 1945 when he became dean and professor of pharmacy at Oregon State College.

Dr. Crossen wrote numerous scientific papers and contributed to the *American Journal of Pharmaceutical Education.* His research activities included the establishment of drug standards for the state of Oregon, studies on the stability of magnesium citrate solution, and improvements in the official methods of analysis. During his lifetime he authored about fifty articles in pharmaceutical chemistry and pharmaceutical education. He also co-authored two textbooks which had wide acceptance in pharmacy.

Dean Crossen rose to the top in influence and achievement in pharmacy in Oregon. He actively participated in the Oregon State Pharmaceutical

Association and was instrumental in revising the constitution and bylaws of the organization. He served many years as chairman of the resolution committee. He had been president of the Oregon branch of the American Pharmaceutical Association.

Under Dean Crossen's leadership the Oregon State College School of Pharmacy became one of the first colleges to adopt the five year curriculum in pharmacy. He foresaw this development in pharmaceutical education. As a result, Oregon State College had this curriculum in practice while most institutions were merely discussing the new program. In spite of outside opposition, he fought for and insisted on high standards in pharmacy. He was primarily interested in quality and effectiveness of instruction rather than in large numbers of students. The achievements of his students following graduation attest to his wisdom and leadership. Due to the high ideals Dean Crossen had set for his students and the strict standards he had maintained for the school, hundreds of students have entered the profession well prepared to fulfill the obligations required of an exacting profession. They have assumed their roles in pharmacy with greater dedication towards the protection of public health.

Dean Crossen was nationally known and recognized. His influence in pharmacy was made known by his active participation in meetings and committees of the American Association of Colleges of Pharmacy and the American Pharmaceutical Association. His outstanding leadership contributed largely to the progress attained in District 7 of the American Association of Colleges of Pharmacy. Several years ago he was one of three nominees for the presidency of the American Pharmaceutical Association. He served faithfully and worked diligently on the resolutions committee of the national organization. He served on the revision committee of the *United States Pharmacopeia.*

His honorary and professional affiliations included: Rho Chi, Kappa Psi, Sigma Xi, Phi Lambda Upsilon, Phi Kappa Phi, American Chemical Society and the American Association for the Advancement of Science.

Dr. Crossen received an "Outstanding Achievement Award" from his alma mater, the University of Minnesota; and recently from the Rexall Drug Company an award for "outstanding service to pharmaceutical education."

All of his efforts were not confined to pharmacy. He found time to participate in many civic, fraternal, and church activities. He participated actively in Kiwanis and headed the Benton County Red Cross. He was chairman of the campus United Fund Drive for many years and served on the county civil defense committee. He was an active member of the Corvallis Country Club and Elks lodge, having served as trustee of the latter. He headed the local Knights of Columbus and actively supported his church. He was a devout Catholic.

Surviving Dean Crossen are his lovely and friendly wife, Eleanor, and their son, William.

The memory of George Edward Crossen will long be cherished by members of his profession. Pharmacy has truly lost a great leader and a champion for the highest ideals within his chosen profession.

Leo A. Sciuchetti

NEW LITTLE PEOPLE

James Harlan Underhill—born September 23, 1958, to Mr. and Mrs. Edward Underhill, University of Rhode Island.

Tracy Gable—born August 4, 1958, to Mr. and Mrs. Fred B. Gable, Temple University.

John Ignatius Campo—born June 30, 1958, to Dr. and Mrs. J. Campo, Rutgers —The State University of New Jersey.

Jane Elizabeth Hintze—born July 3, 1958, to Mr. and Mrs. James R. Hintze, Ferris Institute.

Patricia Jane Fay—born July 18, 1958, to Mr. and Mrs. John T. Fay, Jr., Massachusetts College of Pharmacy.

David and Dennis Lord—born March 30, 1948, became the adopted sons of Dr. and Mrs. Clifton F. Lord, Jr., Southern College of Pharmacy.

Mark Alan Green—born August 1, 1958, to Mr. and Mrs. Donald Green, Idaho State College.

Kenneth Bellafiore—born May 19, 1958, to Mr. and Mrs. Ignatius J. Bellafiore, St. John's University.

MARRIAGES

Mr. David Rockwell DeFanti, University of Rhode Island, to Miss Mary C. Bourret, June 28, 1958.

Dr. Edward L. Platcow, Assistant Professor of Pharmacology, Ferris Institute, to Miss Rosalind Havens, August 7, 1958.

A detached and dispassionate analysis of one's attitude, as well as abilities, will often result in a refreshing "mental bath."

Robert A. Hardt, Am. J. Pharm. Ed., 4, 559 (1940)

STAFF CHANGES . . . . . .

NEW STAFF MEMBERS

University of Washington. Mr. B. Grant Fagg has been given a one-year temporary appointment as instructor of pharmacy. He will continue his graduate studies.

University of Rhode Island. Dr. William C. Evans of Nottingham, England, has been appointed research associate in pharmacognosy.

University of Arizona. Mr. Lincoln Chin has been appointed assistant professor of pharmacology. Mr. Chin is completing the dissertation for his doctorate degree from the University of Utah.

South Dakota State College. Dr. Gary W. Omodt has been appointed assistant professor of pharmaceutical chemistry. Dr. Omodt received his Ph.D. from the University of Minnesota and replaces Dr. Winthrop Lange who resigned to take a position at Massachusetts College of Pharmacy.

Brooklyn College of Pharmacy. Dr. Peter Jurtschuk, Jr., has been appointed research assistant professor of pharmacology. Dr. Jurtschuk received his Ph.D. from the University of Maryland. Dr. A. Stanley Weltman has been appointed assistant professor of pharmacology. Dr. Weltman received his Ph.D. from the University of Missouri.

University of Illinois. Dr. Allan M. Burkman has been appointed assistant professor of pharmacology. Dr. Burkman received his graduate degrees from Ohio State University. Dr. Bernard Ecanow has been appointed assistant professor of pharmacy. Dr. Ecanow was formerly on the staff of Butler University. Dr. Frederick Siegel has been appointed assistant professor of pharmacy. Dr. Siegel received his Ph.D. from the University of Illinois and has just completed two years in the Air Force. Miss Aurelia M. Aro has been appointed instructor of pharmacognosy. Miss Aro received her master's degree from the University of Illinois, Urbana. Mr. Martin M. Rosner has been appointed assistant professor of pharmacy administration. Mr. Rosner completed his graduate work at the University of Arizona.

Howard College. Mr. Joseph L. Box, Dr. George G. Kelley, and Dr. Howard J. Schaeffer have been appointed to part-time positions on the staff. Mr. Elias S. Khalaf has been appointed instructor of pharmacy.

West Virginia University. Dr. Charles W. Blissitt has been appointed assistant professor of pharmacy. Dr. Blissitt recently received his Ph.D. degree from the University of Florida.

Philadelphia College of Pharmacy and Science. Dr. John C. Young has been appointed assistant professor of pharmacy. Dr. Clifford Banta has been appointed lecturer of industrial pharmacy. Dr. Peter B. Russell has been appointed lecturer of organic chemistry. Mr. Carl M. Stohler has been appointed instructor of zoology. Mr. J. K. Bhatnager has been appointed instructor of pharmacognosy. Mr. Leo B. Jordan has been appointed instructor of bacteriology.

Oregon State College. Mr. Norman F. Billups has been appointed instructor of pharmacy.

Rutgers University. Miss Bertha L. Taylor has been appointed assistant instructor of chemistry. Mr. F. Henry Merkle has been appointed instructor of pharmacy.

University of Wisconsin. Mr. Robert W. Hammel has been appointed assistant professor of pharmacy administration. Mr. Richard Strommen has been appointed instructor (extension services). Mr. Ernest W. Stieb has been appointed part-time instructor of pharmacy history. Mr. Stieb is also Secretary of the American Institute of the History of Pharmacy.

Ferris Institute. Mr. Harry S. Swartz, Jr., has been appointed assistant professor of pharmacy administration. Mr. Swartz will begin his duties February 15, 1959, following completion of the requirements for his Ph.D. degree at the State University of Iowa where he has served as an instructor.

University of Texas. Dr. Frank P. Cosgrove has been appointed assistant professor of pharmacy. He was recently on the staff of Loyola University.

Florida A. and M. University. Mr. Hurd M. Jones, Jr., has been appointed professor of pharmacy. Mr. Jones was formerly dean of the School of Pharmacy of Texas Southern University.

New England College of Pharmacy. Dr. Max Metlay has been appointed professor of chemistry and physics. Dr. Metlay was formerly associate professor of chemistry at Harpur College. Mr. Joseph M. Theodore has been appointed instructor of pharmacy. Mr. Theodore received his M.S. degree from the University of Wisconsin.

Southern College of Pharmacy. Dr. Clifton F. Lord, Jr., has been appointed professor of pharmacy and head of the department of pharmacognosy. Dr. Lord was formerly on the staff of the University of Buffalo.

University of Florida. Mr. John W. Keating has been appointed instructor of pharmaceutical chemistry. Mr. Paul Zanowiak Kirkland has been appointed interim assistant professor of pharmacy.

Montana State University. Dr. Charles Roscoe has been appointed assistant professor. Dr. Frank Pettinato has been appointed assistant professor.

Ohio State University. Dr. Arthur C. Lytle, Jr., has been appointed assistant professor of pharmacy. Dr. Lytle received his Ph.D. from Ohio State University majoring in pharmacy administration. Dr. David E. Guttman has been appointed assistant professor of pharmacy. Dr. Guttman was previously research associate in product research and development with The Upjohn Company. Dr. Jules B. LaPidus has been appointed assistant professor of pharmacy. Dr. LaPidus received his Ph.D. degree from the University of Wisconsin majoring in pharmaceutical chemistry. Mr. Clifton J. Latiolais has been appointed director of hospital pharmacy and assistant professor of pharmacy. Mr. Latiolais was formerly assistant director of the Audit of Pharmaceutical Service in Hospitals of the American Pharmaceutical Association and the American Society of Hospital Pharmacists.

Medical College of South Carolina. Dr. William H. Golod has been appointed assistant professor of pharmacy. Dr. Golod received his Ph.D. from Purdue University.

CHANGES IN STAFF TITLES

University of Arizona. Dr. Jack R. Cole has been promoted from assistant professor of pharmacy and pharmaceutical chemistry to associate professor.

Brooklyn College of Pharmacy. Dr. Jack Sosinsky has been promoted from assistant professor of chemistry to associate professor. Dr. Edward Stempel has been promoted from assistant professor of pharmacy to associate professor. Professor Abraham Kreiser has been appointed college alumni director. Professor Chester L. Riess has been appointed director of public relations. Mr. Anatol Mancott has been promoted from laboratory assistant in chemistry to assistant instructor. Mr. Everett Rand has been promoted from laboratory assistant in pharmacy to assistant instructor.

University of Illinois. Dr. Joseph S. Begando, formerly Assistant Dean of the College of Pharmacy, has been appointed special assistant to the President of the University of Illinois. His special assignment will be correlating certain University activities in the President's office. Dr. James Gearien has been appointed acting assistant dean for the current year. Dr. Ralph Daniels has been promoted from assistant professor of chemistry to associate professor.

Howard College. Dr. John E. Wintter has been promoted from associate professor of pharmaceutical chemistry to professor.

West Virginia University. Dr. LeRoy H. Saxe, Jr., has been promoted from assistant professor of pharmacology to associate professor.

Texas Southern University. Dr. Edward J. Eugere has been appointed dean of the School of Pharmacy.

Ferris Institute. Mr. Clark A. Andreson, Associate Professor of Pharmacy, has been named assistant dean of the Division of Pharmacy.

University of Texas. Mr. J. H. Arnette, Lecturer and Director of Pharmacy Extension Services, has been appointed assistant dean of the College of Pharmacy.

St. John's University. Mr. Hugh J. Luongo, Associate Professor of Chemistry, has been appointed administrative assistant to the dean of the College of Pharmacy.

Florida A. and M. University. Mr. John Henry Brown has been promoted from instructor of pharmacognosy to assistant professor of pharmacognosy.

Massachusetts College of Pharmacy. Dr. Charles W. Bauer, Chairman of the Department of Chemistry, has also been named director of research. Professor Mitchell J. Stoklosa has been named chairman of the department of pharmacy. Mr. Douglas Kay has been appointed instructor of chemistry; Mr. Herbert P. Fechter has been appointed instructor of pharmacy administration; and Mr. Edward F. LaSala has been appointed instructor of chemistry.

Montana State University. Dr. John L. Wailes has been promoted from assistant professor of pharmacy to associate professor.

Ohio State University. Dr. Frank W. Bope, Associate Professor, has been appointed secretary of the College of Pharmacy.

University of Maryland. Dr. Norman J. Doorenbos has been promoted from assistant professor of pharmaceutical chemistry to associate professor.

Loyola University. Dr. Edward J. Ireland has been appointed dean of the College of Pharmacy. Dr. Ireland previously held the title of professor of pharmacognosy and pharmacology.

In time drugstores will sell packaged goods, and the profession of pharmacy will entrench itself in laboratories and pharmaceutical shops.

Emerson G. Wulling, Am. J. Pharm. Ed., 5, 20 (1941)

GENERAL NEWS

Webster honored. On Wednesday, September 10, 1958, the Illinois Pharmaceutical Association, the Chicago Retail Druggists Association, the Illinois Pharmaceutical Travelers' Association, the Chicago Branches of the American Pharmaceutical Association, and the Illinois Society of Hospital Pharmacists tendered a dinner to Dean and Mrs. G. L. Webster at the Furniture Club on Lake Shore Drive, Chicago. About 300 persons were at attendance. The meeting was in recognition of Dr. Webster's appointment to the deanship of the University of Illinois College of Pharmacy.

Rau resigns. Mr. William Rau of Howard College has resigned from the staff.

Model pharmacy at Howard. A model pharmacy operation was initiated in September by the Division of Pharmacy, Howard College. The pharmacy was designed by the well-known drugstore designer, Jack L. Snowden. Equipment was donated by pharmacy alumni and friends. Manufacturers of drugs, cosmetics, and sundries generously contributed the initial stock.

Arkansas seminar. The faculty of the School of Pharmacy, University of Arkansas, has initiated a series of seminars to improve teaching methods.

Strickland receives grant. Dr. William A. Strickland of the University of Arkansas has been granted $1200 by Parke-Davis and Company for a series of studies on the "Adsorption Isotherms of Moisture in Various Powders."

PCP offers educational programs. The Philadelphia College of Pharmacy and Science will participate in the University of the Air, Channel 6, Philadelphia, presenting fourteen weekly talks by members of the faculty on "You and Your Health." The pharmacology department of PCP, under the direction of Dr. G. Victor Rossi, will sponsor through the winter months a series of Tuesday evening lectures on drug evaluation by scientists from pharmaceutical manufacturing companies.

Patterson resigns. Professor George W. Patterson, Jr., of Philadelphia College of Pharmacy and Science has resigned his post in bacteriology after more than thirty years of service.

West Virginia moves. During the month of July the College of Pharmacy of West Virginia University moved to its new quarters in the Medical Center. The address of the institution has been changed from College of Pharmacy, West Virginia University, Morgantown, West Virginia, to School of Pharmacy, West Virginia University, Medical Center, Morgantown, West Virginia.

Lyman Hall dedicated. On October 2, 1958 the University of Nebraska dedicated the new Lyman Hall which will house the College of Pharmacy and the Department of Bacteriology. The beautiful new building is named in honor of the late Dr. Rufus A. Lyman who was dean of the College of Pharmacy for thirty-eight years and the founding editor of this journal. Participating in the dedication were Dean Joseph B. Burt; Dr. Robert L. Swain, Chairman of the Council, American Pharmaceutical Association; Dr. Louis C. Zopf, President, American Association of Colleges of Pharmacy; Dr. George D. Beal, President, American Council on Pharmaceutical Education; Dr. Robert A. Hardt (Nebraska class of 1922), President of Armour Pharmaceutical Company; Mr. James L. Hamik, President of the University of Nebraska Student Branch of the American Pharmaceutical Association; Dr. Clifford M. Hardin, Chancellor of the University of Nebraska; Mr. Lewis E. Harris, Chairman of the Advisory Committee, the Rufus A. Lyman Memorial Fund; Dr. Carl E. Georgi, Chairman of the Department of Bacteriology; and Mr. Carl Y. Thompson, President of the Board of Regents of the University of Nebraska. At the dedication ceremony a portrait of Dr. Lyman was unveiled which now hangs in the building.

Svoboda resigns. Dr. Glen Svoboda, Assistant Professor of Pharmaceutical Chemistry, Oregon State College, resigned his position to accept a position on the faculty of the University of Wisconsin.

Oregon committee appointed. President A. L. Strand, Oregon State College, has appointed an interim administrative committee for the School of Pharmacy consisting of Dr. R. S. McCutcheon, Dr. Leo A. Sciuchetti, and Professor Herman C. Forslund, Chairman. The committee will function until the administration has selected a dean to replace the deceased Dr. George E. Crossen.

Martin returns. After a year's sabbatical leave in Switzerland, Dr. Charles F. Martin has resumed his duties as associate professor of pharmaceutical chemistry at the State College of Washington. During the 1957-58 school year he conducted research in the chemistry of carotinoid hydrocarbons under the direction of Dr. Paul Karrer at the Chemical Institute of the University

of Zurich. While in Europe Dr. Martin and his family visited some of the pharmaceutical manufacturing plants and toured in England, France, Germany, and Italy.

Hampton returns. Mr. Richard Hampton, after a year's leave of absence to pursue work toward his Ph.D. in pharmacy administration at the University of Wisconsin, has returned to his position of assistant professor of pharmacy administration on the faculty of the State College of Washington.

Engel studies. Dr. Stanford L. Engel, Assistant Professor of Pharmacology, Rutgers University, took part in a four-week course in the study of radioisotope techniques at the Oak Ridge Institute of Nuclear Studies.

Rutgers extension courses. The following courses were offered during the fall semester under the auspices of the pharmacy extension service of Rutgers University in cooperation with the University Extension Division: "A Survey Course in Pharmacology" under the direction of Dr. Theodore O. King; the fourth annual series of lectures for pharmaceutical industry executives on the "Development and Marketing of Drugs"; "Survey Course in Bacteriology and Microbiology" under the direction of Dr. Thomas C. Grubb; "Chemistry of Perfume Materials" under the direction of Dr. Donald Denney; "Perfumery and Essential Oils" under the direction of Mr. Stefan Arctauder.

Plein on Sabbatical. Dr. Elmer M. Plein of the University of Washington has been granted a sabbatical leave for the fall quarter to tour the United States making a study of manufacturing and hospital pharmacy programs as a preliminary step to setting up courses of study in these divisions at the University of Washington. He will include in his tour twenty-five academic institutions, hospitals, and manufacturing plants.

Washington receives grant. The College of Pharmacy of the University of Washington has received a $3,000 grant from the Upjohn Company in support of the over-all college research program .

LKS award. Chi Chapter of the University of Washington has been presented with the Lambda Kappa Sigma Efficiency Cup for the third time. The chapter will have permanent possession of the trophy. The award was made at the annual convention of the sorority in Seattle.

Minnesota seminar host. On July 13-18 the University of Minnesota was host to the AACP Teachers' Seminar on Pharmaceutical Chemistry. There were 125 registrants from approximately sixty-five colleges of pharmacy, including two in Canada. Proceedings of the Seminar are now in press and will be mailed to all registrants and colleges of pharmacy.

Niles dies. Dean Emeritus Edward H. Niles of the College of Pharmacy of Butler University died on September 23, 1958.

Gibson at Butler. Mr. William R. Gibson of the Pharmacology Department of Eli Lilly and Company has been employed to teach the course in bioassay to students at Butler University. Mr. Gibson replaces Dr. Edward Swanson with whom he was associated for many years at Eli Lilly and Company.

Arizona grants. Three research grants were recently awarded to faculty members of the University of Arizona College of Pharmacy. A grant from the Arizona Division, American Cancer Society will permit Dr. Mary E. Caldwell to continue her study of the behavior of tumors implanted in the mouse treated with extracts of higher plants. Dr. Jack R. Cole and Dr. Joseph A. Zapotocky have received U.S. Public Health Service grants for the phytochemical investigation of Yerba del Manza and for the determination of alkaloid content of living plants.

Kansas City extends program. The five year program has been initiated at the School of Pharmacy of the University of Kansas City. The school is on a one-four program with an optimal two-three plan available. Distribution of the students in each plan is about equal.

Galysh and Blake grant renewed. Dr. Fred Galysh and Dr. Martin Blake of North Dakota Agricultural College received a renewal of their research grant from the North Dakota Heart Association.

Schalker at Pfizer. Dr. William Schalker, North Dakota Agricultural College, spent a month in the product formulation department of Pfizer Laboratories in Terre Haute, Indiana.

Wurster in Rumania. Dr. Dale E. Wurster, University of Wisconsin, gave invitation lectures at the National Conference of Pharmacy, Bucharest, Rumania, and was named honorary member of the Society of Medical Sciences.

Smissman honored. Dr. Edward E. Smissman, University of Wisconsin, has been elected vice-chairman of the Division of Medicinal Chemistry of the American Chemical Society.

Wisconsin hosts Lebanonese. Professor Amin Haddad, Director of the School of Pharmacy, American University of Beirut, Lebanon, is in residence for a year of advanced study and observation at the University of Wisconsin.

Beal at Wisconsin. Dr. Jack Beal of Ohio State University is in residence at the University of Wisconsin as a National Science Foundation Faculty Fellow and Hon-

orary Fellow (1958-59) of the University of Wisconsin.

Salisbury at Wisconsin. Dr. Rupert Salisbury, Ohio State University, was a visiting research professor during the summer of 1958 at the University of Wisconsin.

Wisconsin grants. The National Institutes of Health have extended grants to members of the University of Wisconsin staff for the following projects in the amounts indicated: Dr. S. Morris Kupchan for a six-year study of "The Chemistry of the Veratrum Alkaloids" ($101,000); Dr. August P. Lemberger for studying intravenous fat emulsions ($17,000); and Dr. Takeru Higuchi for a three-year study of "Interaction of Organic Molecules in Aqueous Solutions" ($34,000). Professor Higuchi also received two new research grants from the Army Chemical Corps ($49,000) for studies of "Structure-Activity Relationship" and "Kinetics of Reaction of Organo-halogenating Agents with Tertiary Amines."

Houston in new quarters. The University of Houston College of Pharmacy classes and laboratories are now being held in the $1,500,000 Fred J. Heyne Building following the recent move from the old quarters in the Science Building. The Heyne Building, which is shared with the College of Business Administration, is air-conditioned and consists of two stories and a basement. Space occupied by the College of Pharmacy includes separate laboratories for pharmaceutical chemistry, dispensing, and operative pharmacy, a balance room, two store rooms, offices and research laboratory for the dean, office space and a research laboratory for the staff, library and classrooms. The Department of Pharmacology, which moved into new quarters in the Psychology Building during the 1954-55 school year, will remain in its present quarters until a Pharmacy-Chemistry Building is available.

Gjerstad receives grant. Dr. Gunner Gjerstad, University of Texas, has received a grant of $2300 from the U. S. Public Health Department for the study of the effects of gibberellic acid on medicinal plants.

Florida A. and M. resignations. Mrs. Kathleen S. Baker and Mrs. Irene B. McClain have resigned from the staff of Florida A. and M. University.

Heller elected. Dr. William Heller, University of Arkansas, has been elected President of the American Society of Hospital Pharmacists. He will take office the week of April 19, 1959.

St. John's moves. As of September, 1958, the College of Pharmacy of St. John's University relocated to the new Science-Pharmacy Building on the Hillcrest Campus of St. John's in Jamaica, New York.

King at New England. The Honorable Rudolph F. King, former speaker of the Massachusetts House of Representatives and former Registrar of Motor Vehicles of the Commonwealth of Massachusetts, and Trustee of the New England College of Pharmacy, has been appointed by the Board of Trustees as Director of Development for the New England College of Pharmacy.

Hospital pharmacy book. The book, *Pharmacy Service in Smaller Hospitals*, edited by Professor Alex Berman and Mr. John Zugich of the University of Michigan, is now being distributed free in single copies by the University of Michigan College of Pharmacy. This publication is one of the products of a project financed by funds granted to the College of Pharmacy by the University from a Michigan legislative appropriation for research in the utilization of human resources. It has as its objective to be a guidebook and resource manual for administrators of smaller hospitals and community retail pharmacists who affiliate with smaller hospitals.

Krezanoski receives grant. Dr. Joseph E. Krezanoski, Medical College of Virginia, is the recipient of two research awards for work in the field of drug action at the cellular level. Sigma Xi awarded $300, and the A. D. Williams Fund at MCV made available $1,000.

MCV honorary degree. The Medical College of Virginia awarded the honorary degree of Doctor of Pharmaceutical Science to E. Claiborne Robins, President of the A. H. Robins Company, Inc., at the May commencement exercises.

Ware honored. Mr. Ralph M. Ware, Secretary of the Virginia Board of Pharmacy and Instructor of Jurisprudence at the Medical College of Virginia, was named pharmacist of the year in Virginia for 1958.

Florida doctorates. In August five Ph.D. degrees were awarded in pharmacy at the University of Florida. Dr. James Gordon Duff will teach in Saskatchewan, Dr. Arthur Jay Getzkin will serve in the U.S. Navy, Dr. Walter Dean Kirkland will teach at Florida. Dr. Howard Everett Mossberg will teach at Southwestern State College, and Dr. Noel Oliver Nuessle will teach at the University of Kansas City.

Suchy retires. Dr. John F. Suchy upon reaching the mandatory retirement age of seventy at Montana State University has retired from the institution to join the staff of the College of the Pacific School of Pharmacy as a visiting professor of pharmaceutical chemistry.

Brunett resigns. Mr. Emery Brunett has resigned from his position of instructor of pharmacy at Montana State University to

work on his Ph.D. degree at the University of Washington.

Newton elected. Dr. Howard C. Newton, Dean of the Massachusetts College of Pharmacy, has been elected President of the American Pharmaceutical Association. He will take office in April, 1959.

Pitt grant. The University of Pittsburgh School of Pharmacy has received an $18,360 grant to study anti-hypertensive drugs from the National Institutes of Health. Dr. Joseph P. Buckley, Professor of Pharmacology, will be the principal investigator. Dr. Buckley's earlier work in this area of study has been supported by Lakeside Laboratories and Hoffman-LaRoche.

Ohio State remodels. The Ohio State University College of Pharmacy is undergoing a $52,000 remodeling which will provide more staff offices, an additional graduate laboratory, and new desks in the dispensing laboratory.

Ohio State scholarships. Ohio State University College of Pharmacy is the recipient of three new scholarship awards. The Bailey Drug Company of Zanesville, Ohio, has established a scholarship consisting of $270 a year, renewable for five years for a pre-pharmacy freshman entering Ohio State University. The Cleveland Alumni of Rho Pi Phi have established the Dean Clair A. Dye Scholarship and the Dean Bernard V. Christensen Scholarship of $200 each. The Cleveland Academy of Pharmacy has established a fund of $500 for scholarships for 1958-59.

NIH grants to Ohio State. Dr. Loyd E. Harris and Mr. Donald Lamb of Ohio State University have received a $2300 NIH grant to study "Free Energy Relationships and Biological Actions." Dr. Jack L. Beal and Dr. Arthur Tye have jointly received NIH grants amounting to $108,380 over a period of three years for phytochemical studies for medicinal constituents.

AIHP request. The American Institute of the History of Pharmacy, University of Wisconsin, announces that it is interested in receiving collections of books, manuscripts, photos, paintings, or artifacts that are of historical significance to pharmacy. Educators are asked to pass this information along to pharmacists who are planning to retire or to families of deceased pharmacists who are at a loss as to how to dispose of such personal effects which may be of historical significance.

Beckett at Maryland. Dr. Arnold H. Beckett, Chelsea School of Pharmacy, Chelsea College of Science and Technology, visited the School of Pharmacy, University of Maryland, and gave two public lectures entitled "Chelation and Antibacterial Activity," and "Stereochemical Analgesics." He also gave a lecture to undergraduate students entitled "Pharmacy in England."

Sterling-Winthrop aid to Maryland. The Sterling-Winthrop Research Institute has recently given a $3600 fellowship for research with azasteroids to the School of Pharmacy, University of Maryland. The fellowship will be administered by Dr. Norman J. Doorenbos, Associate Professor of Pharmaceutical Chemistry. In addition, Sterling-Winthrop Research Institute is assisting the steroid research program by furnishing steroid intermediates, analyzing products, and biologically screening products of this research program.

Cancer grant to Maryland. The Cancer Institute, National Institutes of Health, has awarded $38,000 to Dr. Norman J. Doorenbos, University of Maryland, for a three-year study of steroids of potential medicinal interest.

Libyan at Maryland. Mr. Nosart Jerbi of Libya and son of the Libyan Ambassador to the United States was a recent visitor at the University of Maryland School of Pharmacy. Mr. Jerbi is a pharmacist and a graduate of the University of Rome.

Polish visitor. Dr. Boguslaw Bobranski, Professor of Pharmaceutical Chemistry at the Medical Academy, Wroclaw, Poland, recently visited the School of Pharmacy of the University of Maryland. Dr. Bobranski is president of the Academy and was visiting in this country on a Rockefeller grant.

Cronk resigns. Dr. Dale H. Cronk, Medical College of Virginia, resigned to accept a position on the faculty of the School of Pharmacy of Northeast Louisiana State College.

National Foundation plans. The National Foundation recently announced its professional education program for the future. It will be a flexible structure functioning essentially through four channels: 1. Scholarships for basic education in a field; fellowships at the predoctoral and postdoctoral level; 2. Grants to medical schools to expand staffs and facilities, to prepare needed teaching materials; 3. Production and distribution to the professions of teaching aids—such as booklets, manuals, textbooks, films, slides, and various scientific exhibits; 4. Media for carrying information to the professional public similar to those now available in *Poliolyelitis Current Literature* and *Collected Reprints of the Grantees.*

New program at Pitt. The University of Pittsburgh has approved a new graduate training program leading to the doctor of philosophy degree with a major in pharmacology.

Beal retires. Dr. George Denton Beal retired as Director of Research at Mellon Institute August 31 after thirty-two years of service. Dr. Beal is seventy-one years old.

Mrs. Andrews at Syracuse. Mrs. Theo-

dora Andrews, full-time librarian of the School of Pharmacy at Purdue University, taught two courses at the School of Library Science at Syracuse University during a six-week summer term. The courses were "General References" and "Bibliography of Science and Technology." For two years prior to this teaching assignment, Mrs. Andrews had been taking postgraduate work at the School of Library Science at the University of Illinois.

New programs at Rutgers. Rutgers University's College of Pharmacy offers doctor of philosophy programs in pharmacy and pharmaceutical chemistry this fall. The doctoral offerings in these fields will be the first in the New York area. The introduction of the doctoral programs has required the construction of two new graduate laboratories.

Formulary service. *The American Hospital Formulary Service,* compiled and published by the American Society of Hospital Pharmacists, was made available in September. Hospitals throughout the nation, as well as physicians, pharmacists, and nurses, will be interested in the Service which will provide drug monographs in loose-leaf form together with supplementary monographs to be issued at regular intervals. Thus, for the first time in American history, the tedious, time-consuming task of compiling individual hospital formularies will be no longer necessary.

Drug monographs for the *American Hospital Formulary* are being prepared by Dr. William M. Heller, Chief Pharmacist of the University of Arkansas Medical Center at Little Rock, who, as Chairman of the Committee on Pharmacy and Pharmaceuticals of the American Society of Hospital Pharmacists, is in charge of the project. Dr. Heller is being assisted by Dr. Marc Jordin, Head of the Department of Pharmacology of the University of Arkansas School of Pharmacy.

The *American Hospital Formulary* is a loose-leaf collection of monographs which the medical staff of each hospital may use in preparing its own formulary. One of the most important factors in the new *Formulary Service* is that the medical staff of each hospital retains complete authority as to the drugs which will be included in the formulary of its hospital. Thus, working through the Pharmacy and Therapeutics Committee, each medical staff will select from the *American Hospital Formulary* only those drugs it considers most useful. Drug monographs not wanted by the medical staff may be omitted from the loose-leaf formulary.

The new *Formulary* is designed to provide a convenient reference for physicians, nurses, and pharmacists regarding drugs, their dosage forms, dosage and routes of administration, side effects and toxicity, and unusual procedures or precautions which may be necessary in their administration. Helpful and meaningful descriptions of each drug, its actions and uses, dosage, and preparations are stated concisely.

The *American Hospital Formulary* will be distributed through the Hamilton Press, Hamilton, Illinois. The price of the *Formulary*, which includes the drug monographs, a loose-leaf notebook, and supplementary monographs for one year, is as follows: 1 to 9 copies — $15.00 each; 10 to 24 copies — $14.50 each; 25 or more copies — $14.00 each.

Application and use of the *American Hospital Formulary Service* are described by Dr. William M. Heller in an article appearing in the June issue of the *American Journal of Hospital Pharmacy*. Reprints of the article are available upon request.

Plant Science Seminar. Ninety-seven persons were registered for the Thirty-fifth Annual Plant Science Seminar held on the campus of Ferris Institute August 18-22, 1958. The program was as follows:

Monday, August 18, 9:00 a.m.—Registration and coffee hour, Science Hall; 10:00 a.m.—Opening Business Session, William A. Pearson Lecture Hall, Science Hall; Call to order by Chairman, Dr. Arthur E. Schwarting, University of Connecticut, College of Pharmacy; Welcoming Remarks, Dr. Victor F. Spathelf, President, Ferris Institute; Chairman's Address; Appointment of Committees; Announcements by Local Secretary, Dr. Edward P. Claus; Tour of the Pharmacy Division and General Education Laboratories in Science Hall; 12:30 p.m.—Luncheon; 2:00 p.m.—Lecture Session, Practical Aspects of Herbicides," Dr. B. H. Grigsby, Professor of Botany and Plant Physiology, Michigan State University; 3:00 p.m.—"Is There a Fungus in Us?" Dr. E. S. Beneke, Associate Professor of Mycology, Michigan State University; 4:00 p.m.—Tour of Ferris Institute Campus; 6:30 p.m.—Picnic supper, boating and swimming at School Section Lake; 8:30 p.m.—"The Impact of the Lumbering Era on Michigan's Ecology," Dr. George R. Wheeler, Head of the Department of Agriculture, Central Michigan College.

Tuesday, August 19, All-day trip to the main plant of the Dow Chemical Company in Midland, Michigan; 10:00 a.m.—Stops at the greenhouses and farms maintained by the Dow Chemical Company for the development, screening, experimental testing, and practical applications of insecticides, fungicides, and other agents used in pest control; 12 noon—Luncheon: Courtesy of the Dow Chemical Company; 1:30 p.m.—Visits to the Saran Wrap Division and phytochemical research laboratories of the Dow Chemical Company; 3:30 p.m.—Departure from Midland. Stops will be made to observe local geology and flora under the direction of Dr. George R. Wheeler, Central Michigan College; 8:00 p.m.—"The Christmas Tree Business," illustrated lecture, Mr. Milton E. Deurloo, Professor of Accounting and of Taxation, C.P.A., Ferris

Institute; 9:30 p.m.—Pictures of the 1957 Plant Science Seminar.

Wednesday, August 20, 8:30 a.m.—"The Use of Radioactive Isotopes in Aquatic Biological Research and Teaching," a lecture-demonstration, Dr. LaVerne L. Curry, Professor of Biology, Central Michigan College; 10:30 a.m.—Group photograph; 10:45 a.m.—Local Trips, 1. H. J. Heinz Company, to observe sorting and preparing cucumbers for pickle processing; 2. Wolverine Shoe Factory, to observe the procedures used in manufacturing shoes; 12:30 p.m.—Luncheon; (1:00 p.m.)—(Ladies luncheon and card party at Osburndale on the Muskegon River. A special lecture on flower arranging will be given by Mrs. George Pratt, co-owner of the Big Rapids Greenhouse); 2:00 p.m.—Research Reports by Seminarians, "The Effect of Gamma Irradiation (Cobalt-60) on Potato Plants (*Solanum tuberosum* l.)," Dr. Mary L. Anderson, Detroit, Michigan; "Alkaloids of the Genus *Vinca* (*Apocyanaceae*) with Special Reference to *Vinca major*," Mr. Norman R. Farnsworth, University of Pittsburgh, School of Pharmacy; "A Phytochemical Investigation of the Leaves of *Pyrularia pubera* Michx (*Santalaceae*)," Mr. Ralph N. Blomster, University of Pittsburgh, School of Pharmacy; "A Historical Sketch of the Uses of Mistletoe (*Viscum album*)," Dr. Anna H. Koffler, Ohio Northern University, College of Pharmacy; "Studies of the Genus *Thymus*," Dr. Ikram Hassan and Dr. Marin S. Dunn, Philadelphia College of Pharmacy and Science; 8:00 p.m.—Collaborative Laboratory Session, Moderator, Dr. Edward P. Claus, Ferris Institute, Division of Pharmacy; "Antibiotics and the Pharmacognosy Laboratory," Dr. Harold E. Bailey, Wayne State University, College of Pharmacy; "Detection of alpha and beta Glucosides in Crude Plant Materials," Dr. Egil Ramstad, Purdue University, School of Pharmacy; "Comparison of Digitalis, Belladonna, and Stramonium Leaves," Dr. Frank J. Pokorny, Columbia University, College of Pharmacy; "Saponins and Saponin Drugs in the Pharmacognosy Laboratory," Dr. Karlis K. Kazerovskis, Ferris Institute, Division of Pharmacy; 1:00 p.m.—Annual Watermelon Party.

Thursday, August 21, 9:00 a.m.—Research Reports by Seminarians, "A Study of the Influence of Gibberellic Acid on *Fagopyrum esculentum* and the Biosynthesis of Rutin," Dr. Jack L. Beal, Ohio State University, College of Pharmacy, and Dr. M. Darwish Sayed, University of Rhode Island, College of Pharmacy; "The Effect of Mineral Nutrition on the Growth and Amino Acid Metabolism of Peppermint (*Mentha piperita*)," Dr. Frank A. Crane, University of Illinois, College of Pharmacy; "The Domestic Production of Medicinal Plants in Washington," Dr. Kenneth Redman, South Dakota State College, School of Pharmacy; "A Discussion of the Fallacies of Antibiotic Comparisons," Mr. Norman R. Farnsworth, University of Pittsburgh, School of Pharmacy; 12:30 p.m.—Luncheon; 2:00 p.m.—Final Session; Discussion and Suggestions for 1959; Teacher's Seminar in Pharmacognosy; Reports of Committees; Report of the Secretary-Treasurer, Dr. Frank L. Mercer, St. Louis College of Pharmacy and Allied Sciences; Election of Officers.

(9:00 a.m.)—Ladies' all-day trip to Grand Rapids; (10:30 a.m.)—Visit to the furniture display rooms in the Exhibitors' Building; (12:30 p.m.)—Luncheon at Win Schuler's Restaurant; (1:30 p.m.)—Visit to the Decorative Arts Museum; (3:00 p.m.)—Time for shopping; (4:00 p.m.)—Departure for Big Rapids. 6:30 p.m.—Annual Plant Science Seminar Banquet; Presentation of the Annual Edwin L. Newcomb Memorial Awards in Pharmacognosy, Dr. Heber W. Youngken, Sr., Chairman of the Awards Committee; Undergraduate Winner: "A Pharmacognostical and Phytochemical Study of *Maianthemum canadense* Desf," Mr. Charles W. Dickerson, Ferris Institute, Division of Pharmacy; Graduate and Faculty Winners: "A Study of the Influence of Gibberellic Acid on the Macromorphology, Histology, and Biosynthesis of the Glycosides of *Digitalis purpurea* Linne," Dr. Mahmould D. Sayed, University of Rhode Island, College of Pharmacy, and Dr. Jack L. Beal, Ohio State University, College of Pharmacy; Installation of Officers for 1958-1959; "Michigan—Water Wonderland," an illustrated lecture, Mr. Aurey Strohpaul, Secretary-Manager, West Michigan Tourist and Resort Association.

Friday, August 22—All-day trip to places of interest in western Michigan; 9:30 a.m.—Guided tour through the Consumers Power Company Hydro-electric Plant near Croton and Hardy Dams on the Muskegon River; 10:30 a.m.—Visit to the Gerber Products Company, Fremont, to observe processing of baby foods; 12:30 p.m.—Luncheon: Ramshorn Country Club, Fremont; 2:45 p.m.—Fishing and bathing at Ludington, on Lake Michigan.

Before we as pharmacists can prove our worth to the outside world, we must first prove our worth to ourselves.

B. V. Christensen, Am. J. Pharm. Ed., 2, 204 (1938)

BOOK REVIEWS

Chemistry of Lipides as Related To Atherosclerosis, Irvine H. Page, Editor. Charles C. Thomas, Springfield, 1958. xi + 342 pp., 87 figs., 39 tbls. $8.50.

This is a compilation of papers and discussions from a symposium held at the National Heart Institute, May 7 and 8, 1957. The papers are summaries of particular aspects of lipide chemistry given by authorities in the field. Although addressed to the ninety-seven participants of this symposium, the material presented is written in the form of essays which will be useful to anyone who wishes to know the basic groundwork which has been done in this field recently. The book is divided into four parts, Chemistry of Lipides as Related to Atherosclerosis, Lipide Chemistry and Distribution, Absorption and Transport, and Cellular Metabolism. Only the first part justifies the title; the remaining three sections are concerned with fundamental chemistry. Part One consists of two papers; the first outlines the nature of the symposium; the second is a discussion of the use of gas-liquid chromatograms for studying unsaturated fatty acids, but the application to coronary artery disease covers a single page and four figures. The next four chapters are concerned principally with the elementary organic chemistry of fatty acids, triglycerides, phospholipides, and sphingolipides. Two chapters on the physical chemistry of lipoproteins complete the section. The succeeding ten chapters discuss biochemistry and nutrition of lipides. Because of the rapid progress in these areas, the reader will probably find this section the most valuable. This is not a reference work; none of the chapters can be considered to be comprehensive reviews of more than segments of the subject. The expert will refer to the more comprehensive treatments to which the authors often give reference. The expert as well as the scientist in general will find this a well-edited compilation of important topics in lipide chemistry.

John L. Wood
University of Tennessee
Medical Units

Soviet Pharmaceutical Research, Volume I, Pharmaceutical Chemistry. Consultants Bureau, Inc., 227 West 17th Street, New York 11, New York, 1958. v + 447 pp. $95.00 (paper).

The compilation of papers in this work represents the English translation of seventy-four scientific reports from five Soviet chemical journals for the years 1949-1955. The journals which were abstracted are: *Journal of Applied Chemistry, Journal of Analytical Chemistry, Bulletin of the Academy of Sciences, Division of Chemical Sciences, Colloid Journal,* and the *Journal of General Chemistry.* All abstracted papers are of a pharmaceutical chemistry nature.

The contents of the text is divided into five parts; namely, papers dealing with solubility, stability, ion-exchange, emulsions, suspensions and gels, and a miscellaneous section.

There are seventeen papers dealing with solubility studies. Among those of most interest to the reviewer are the series of five papers by Akhumov and Spiro on "The Patterns of Solubility Change" and a paper by Markina, Pospelova, and Rebinder entitled "Dependence of the Solubilization of Certain Organic Liquids on the Concentration of the Solubilizing Agent."

Of the six papers dealing with stability studies, a paper entitled "Thermal Stability of Collagen in the Dry State" by Kutyanin and another entitled "Oxidation and Dehydration of Caster Oil" by Plisov and Tomson were most interesting.

There are eight papers on the subject of ion-exchange and thirteen dealing with emulsions, suspensions and gels, every one of which is highly thought provoking and involves very sound scientific techniques.

There are thirty papers in the miscellaneous section dealing with various aspects of pharmaceutical chemistry. They are concerned with papers dealing with qualitative and quantitative studies, sorption studies, hydrolysis studies, polarographic observation, etc.

This compilation of papers is a worthwhile addition to any pharmaceutical library. Although the papers represent the field of Soviet pharmaceutical chemistry, they differ in scope from the American concept of this field. For example, there is very little involving analytical studies or organic synthesis. An analysis of the topics covered in the papers indicates that most would come under the subject heading of physical pharmacy in this country. In this respect, individuals in the field of physical pharmacy would find this work of special interest.

Martin Barr
Philadelphia College of Pharmacy and Science

Soviet Pharmaceutical Research, Chemistry Collection No. 4, Vol. II: Pharmacognosy. Consultants Bureau, Inc., New York, New York, 1957. vi + 401 pp. $90.00 (paper).

This volume contains translations of eighty-two selected papers which appeared originally in Soviet chemistry journals during the years

1949-1955. According to the publishers the subject matter of these papers is pharmacognosy, but in the opinion of this reviewer it is more properly natural product chemistry.

According to *Bibliografiya po Lekarstvennym Rasteniyam* by Utkin *et al.*, more than 1100 papers dealing with medicinal plants were published in the Soviet Union during the years 1949-1954. It would seem that a selection of eighty-two papers should give a rather good cross section of this work, but that has not been achieved in this volume. Many of the plants investigated have no known medicinal application nor is any attempt made to establish one in these reports. Much of the work deals with proof of structure and even synthesis of organic compounds.

This anomaly may be explained in part by the fact that all of these papers originally appeared in chemical journals, but this does not explain the use of the title pharmacognosy nor the incorporation of much of the material in a series designated pharmaceutical research. The prospective reader who buys, or persuades his institution to buy, this collection on the strength of the title will be disappointed. A cross-sectional view of Russian pharmacognosy during recent years cannot be obtained from a perusal of this volume.

Once this is understood, all scientists, including pharmacognosists, who are interested in the chemistry of natural products, will profit from a study of this work. Lacking a reading knowledge of the Russian language, this reviewer cannot comment on the accuracy of the translations, but they read smoothly and are apparently well done. Sixty-one of the papers deal with alkaloids, seven with fixed and volatile oils, three with glycosides, and eleven with miscellaneous subjects.

In comparing the price, $90.00 with the makeup of this volume one can only conclude that the cost of translating the Russian language into English is exorbitant. The collection is staple bound in paper covers and lacks both a subject and an author index, although a table of contents is included. The pages are reproduced by a multilith process from typewritten originals employing at least two different kinds of type. The lithography would perhaps be acceptable in an inexpensive laboratory guide but not in a volume of this price. In the review copy pages 64 and 65 are quite blurred, and the last line on page 260 is illegible. Many other pages are also poorly reproduced.

Since the volume contains information which is not otherwise available to most American readers, it has a place in any complete collection of phytochemical publications. However, it would be wise to request a copy of its table of contents from the publisher before placing an order.

Varro E. Tyler, Jr.
University of Washington

Biochemical Cytology, Jean Brachet. Academic Press Inc., New York, New York, 1957. xi + 516 pp, 190 figs. $8.80.

This volume was based upon a series of lectures presented by the author at the Indian Cancer Research Center in Bombay, in 1956. It also represents an expansion of the lectures he presents to his students in the University of Brussels. As is characteristic of volumes originating by these routes it is hardly useful as a textbook even for advanced classes; it is, however, an excellent work of reference and a remarkable synthesis of the studies of many students in a rapidly developing field of research.

A consideration of the recent history of the subject, its techniques, and a final summary occupy three of the ten chapters. A chapter on the cytoplasm of the resting cell considers the cell membrane, microsomes, mitochondria and other cytoplasmic granules, together with the hyaloplasm or ground substance. The nucleus of the resting cell, the subject of the next chapter, considers the nuclear membrane, chromatin, nucleoli, nuclear sap, and the special case of the nuclei of bacteria and yeasts. A chapter on mitosis includes many topics concerning the structure and chemical composition of the chromosomes and of the achromatic apparatus. Mitotic abnormalities, inhibitors, and the stimulation of the process of mitosis are among other subjects that are treated in considerable detail. The roles of DNA in heredity and of RNA in protein synthesis are considered together in a separate chapter. The remaining three chapters covering nucleocytoplasmic interactions of unicellular organisms, embryonic differentiation, and cancer cells are somewhat more limited with respect to the range of organisms that are considered. The author explains in his preface that the apparent imbalance here is explained by his special interests and the problems with which he is most familiar. To this reviewer this emphasis is in no way objectionable; the extensive review of the work of the author and his colleagues on *Acetabularia* and *Amoeba*, for example, is among the many interesting and attractive features of the book.

Extensive lists of the references cited follow each chapter. The book is concluded with only a subject index. The inclusion of an author index would have been a useful addition. Technical details of binding, printing, and the reproduction of half-tones are of excellent quality. A misspelling of "colchicine" on page 168 and the reference on page 114 to a missing figure 54 (there is another figure so numbered) were the only discrepancies noted by the reviewer.

Cytologists and biochemists are much in Professor Brachet's debt for presenting this modern and extensive review of his field. The many references to substances of present and probably future pharmacological signifi-

cance rate this volume among the essential references in any library used by persons engaged in pharmacy research.

Adolph Hecht
State College of Washington

Chemistry of the Steroids, C. W. Shoppee. Academic Press Inc., New York, New York, and Butterworths Scientific Publications, London, England, 1958. vii + 314 pp., 17 tbls. $9.00.

A quarter of a century ago, when the first edition of Gilman's *Organic Chemistry* appeared with its excellent chapter on the steroids, this reviewer resolved to keep abreast of developments in this interesting area of chemistry and medicinal chemistry and found that research papers were appearing in the thirties at approximately the rate of one a day. It is quite possible that in subsequent years the number has increased. This is mentioned to emphasize the magnitude of the task an author faces in distilling out of all these publications a concise, complete, and readily understandable short treatise such as Shoppee's *Chemistry of the Steroids.*

The competence of the author to undertake this task is guaranteed by his extensive participation in research in steroids and from his co-authorship of Chapters XVII, XVIII, and XIX, pp. 765-1049, the sections on steroids, in *Chemistry of Carbon Compounds,* Vol. II B (1953), edited by E. H. Rodd. The timeliness for a new treatise is indicated by the fact that of some 2300 individual papers to which the author refers about 700 were published since the end of 1951, and in the selection of these the author notes "my perpetual problem has been to decide not what to include, but what to omit." It is also of interest that of the 440 papers cited in the chapter on adrenocortical hormones, 225 were published since January, 1952.

The material is covered in six chapters, viz.: I Introduction, Nomenclature, Configuration, Historical Development, Structure and Geometry. II Sterols, Bile Acids, and Related Compounds. III The Sex Hormones. IV The Adrenocortical Hormones. V Cardiotonic Glycosides and Aglycones. VI Saponins and Sapogenins.

The chemistry of each of the topics is clearly, concisely, adequately, and precisely discussed from a logical rather than a chronological point of view, aided by cross references whenever desirable. Mention is made of the biochemical role and clinical significance of most of the natural products.

The specialist in steroids will not want to be without this book, and the nonspecialist will find it stimulating to have so ably presented the results of wide-spread yet intensive research in a field which three decades ago lay beyond the frontiers of science.

Walter H. Hartung
Medical College of Virginia

Pharmacology and Therapeutics, Arthur Grollman. Third Edition. Lea & Febiger, Philadelphia, Pennsylvania, 1958. 1034 pp., 192 figs., 34 tbls. $12.50.

Pharmacology has become such a rapidly advancing field that if an author expects his labor of love to remain free from the infirmities of insidious obsolescence, he must regularly produce new editions. Recently most of our authors and their publishers have found the courage, energy, and fertility to beget once every three or four years. Since Dr. Grollman's older offspring are already well known, all that really needs to be announced here is that he and Lea & Febiger have happily mated once again. For the record though, let's inspect young *P.T.* a bit more closely for family resemblences and also for individuality.

The previous editions of *Pharmacology and Therapeutics* could be described as being "comprehensive but non-encyclopedic." Dr. Grollman's literary style is very compact. Every sentence is important, and little material of strictly background nature is included. While this is necessary for a "short" work on pharmacology, it also makes careful and intelligent reading necessary. It cannot be read hurriedly.

The Third Edition closely resembles its predecessors in style, its content is more comprehensive, and it is, of course, up to date. In most instances revision has been accomplished by minor additions and rewriting, although many sections are new or completely rewritten. This has resulted in 168 additional pages and twelve additional chapters.

One very welcome change is the new index. While an index does not essentially affect the text, a good one can do much to convey the over-all arrangement of material and to convince the reader of its logical order. The new index is a decided improvement. The individual chapters are more completely outlined, and they are now arranged into nine sections based on physiologic systems and therapeutic types.

The book content is typical of pharmacology texts and need not be repeated here. The new chapters and the rewritten sections will be of interest to pharmacologists, and the following are typical: There is a new discussion of pain and analgesia, and the synthetic opiate substitutes are now discussed with the narcotic, rather than the antipyretic, analgesics. A new chapter on psychomimetric and tranquilizing drugs presents an evaluation of the present status of serotonin, hallucinogens, model psychoses, and tranquilizers. Ganglionic blocking and myoneural blocking drugs are now treated in separate chapters with additional material on both. Drugs affecting the heart and vascular system are now considered separately, and there is new material on anti-hypertensive therapy. Anthelmintics are dropped from the group of locally acting gastro-intestinal drugs, and a new chapter on this subject is added to the chemotherapy

section. A new chapter on the chemotherapy of cancer discusses the use of hormones, radioactive compounds, antimetabolites, alkylating agents, etc. The former chapter on hormones has been expanded into an entire section with individual chapters devoted to each gland. Thus Dr. Grollman has added material in the places where the earlier editions were short, and he has eliminated the less compatible bedfellows. The result is a much better-balanced book.

The usefulness of *Pharmacology and Therapeutics* as a text for pharmacy students will depend upon the instructor's lecture approach and the type of use he expects from the student. When the student is to use the book as a basis for departure and the lecture is an amplification of it, then the Grollman Third Edition is a good answer. However, if the lecture gives the basic material and the student is expected to use the text for supplementary reading and as a reference source (also of value after graduation), then an "encyclopedic" text will serve better. Both are valid approaches to text selection, and under the prior conditions, Grollman is better than ever.

It goes without saying that this Third Edition should replace the Second Edition on every library shelf.

Douglas Johnson
Southern College of Pharmacy

Pharmacology in Medicine, Victor A. Drill, Editor. Second Edition. McGraw-Hill Book Company, Inc., New York, New York, 1958. xi + 1273 pp., 190 figs., 130 tbls. $19.50.

This second edition continues to use the format that was so generally acceptable in the first edition of *Pharmacology in Medicine.* It is the collaborative work of eighty-six outstanding researchers of whom seventy-five were contributors to the previous edition. The volume is divided into nineteen divisions (or parts) representing fields of drug application, and eighty-eight chapters each devoted to drugs applicable in that field of interest. This distribution permits presentation of the pharmacology of each drug group by a single expert on that group of drugs. While it is impossible to obtain in a collaboration the smooth continuity found in a singly authored work, Dr. Drill has achieved a satisfactory degree of continuity from chapter to chapter, and the advantages gained by expert contributors more than compensate for this disadvantage. The book may be described as a "modern text," and this is both an advantage and disadvantage. It advantageously permits a most complete coverage of drugs most used in modern medical practice, but it cannot by necessity give the same coverage in detail of lesser important drugs.

The book in its entirety has been revised to conform to the latest editions of the USP, NF, and NND. New drugs have been added, and new information on old drugs has been incorporated into the text. A new section entitled "Psychopharmacology" has been created which includes an entire chapter on "Drugs Affecting Behaviour." In addition to the designated 190 figures and 130 tables, the text is generously sprinkled with additional explanatory figures and charts, and throughout the text are the structural formulae of all drugs where such formulae seem significant.

It is this reviewer's opinion that by any method of comparison *Pharmacology in Medicine* is one of only three books that are "tops" in the field of pharmacology. Any limitations it has by comparison are only relative to the situation at hand, and it possesses a number of features in which it has no rival. While it is described as a *textbook,* it like all other pharmacology books of similar scope is simply "too much book" for the typical undergraduate course in fundamental pharmacology; however, it has a definite place in every medical science library as a reference book for such students. It is definitely recommended as a textbook for pharmacology graduate students. It should find its greatest usefulness as an authoritative modern reference for the practicing physician, the pharmacology teacher, and research worker in pharmacology.

John W. Nelson
Ohio State University

Psychopharmacology, Pharmacologic Effects on Behavior, H. H. Pennes, Editor. First Edition. Paul B. Hoeber, Inc., New York, New York, 1958. xiii + 362 pp., 35 figs., 49 tbls. $8.00.

"I cannot help wondering what is really accomplished by any more such meetings," says one of the eminent contributors to this symposium. Another discussant, widely known for his perceptiveness, pleads for the development of an assent center depressant; that is, a drug that would make it easy to say no to people organizing sessions such as this one.

In the face of such judgments, it does not appear presumptuous for a reviewer to conclude that this volume adds too little, too late.

Of the thirteen papers that make up this book, six are research reports that are probably of interest only to those readers with an active investigative interest in the area. The proportion of previously unpublished material is variable but is not always great. Biochemical, physiological, and animal behavioral studies are presented.

Another four presentations might be termed partial reviews or summaries of limited topics with unblushing emphasis on the work of the man reporting. The content of these sections is quite familiar to anyone with even a casual interest in the subjects, but, on the other hand, the papers are probably too brief to be of value to someone wishing to be initiated into the field.

Two authors, Jarvick, an experimental psychologist, and Kubie, a psychoanalyst, offer

papers that attempt to be critical and analytical. Both essays, judged in the light of my prejudices, fail of their purpose, but the purpose of each is important.

The remaining paper is a review, interesting but inconclusive, of the biotransformation and biochemical effects of several agents capable of causing a toxic psychosis, or as such drugs are now called, hallucinogens or even psychotomimetics.

The discussions that follow each paper suffer from the ennui betrayed by remarks similar to those quoted in the opening paragraph. The composition of the group is interdisciplinary, but the papers and discussions develop along strictly disciplinary lines. Some of the discussants present aspects of their own research with vigor, but the challenges deserved by some of the speakers do not appear. Dr. Gerard, it must be admitted, was testier than usual, but he does not appear until time for his accustomed summarizing role.

This book, then, must be judged by comparison with the publications from the many similar symposia and conferences that preceded it. So judged or by comparison with the monograph of Wikler reviewed in the Spring, 1958 issue of this journal it is not impressive.

Frederick H. Meyers
University of California

Hypotensive Drugs, M. Harington, Editor. Pergamon Press, Inc., New York, New York, 1956. x + 222 pp., 75 figs., 12 tbls. $8.00.

This little book, as the name implies, deals with drugs used to lower blood pressue and is deceiving in the wealth of information which it contains. It is in fact the proceedings of a two-day symposium on this subject held in London during April of 1956 at the Wellcome Foundation. Many of the foremost authorities on this subject, especially of Europe, presented papers or participated in the discussions and thus various angles of interpretation are well covered.

In his opening remarks to the symposium M. Harington, M.B., M.R.C.P., who is also the editor of this book, calls attention to the authoritative statements which will be made concerning the present status of these drugs. He also expresses the hope that various weaknesses in this group of drugs may be clearly brought out and that suggestions may be made for future investigations and improvements. These suggestions for future investigations constitute an important part of the book. In addition to the opening remarks twenty-three papers including tables and figures are presented with references which in themselves indicate the high caliber of the presentations. Also there are seventy-five paragraphs of discussion, some short but a few of more than a full page. Thus few relevant facts escape mention.

Space does not permit inclusion of even the names of the many contributors or the briefest comments concerning the individual papers. The first of four sessions was devoted to four papers and to much discussion concerning the "chemical and biochemical aspects" of many hypotensive drugs including veratrum alkaloids, hydralazine, tolazoline, pentolamine, dibenamine, alkaloids of Rauwolfia, and ganglion-blocking agents as to their relative effect on sympathetic and parasympathetic ganglia. During the second session seven papers and more than thirty discussions were devoted to "The Pharmacology of Hypotensive Drugs" including the groups just mentioned. The third Session on "Clinical Applications of Hypotensive Drugs" dealt with various forms of hypertension and the principles and details of therapy including the clinical evaluation of hypotensive drugs under controled conditions. It is impossible to summarize the five important papers presented, but it seems conservatively agreed that hypotensive drugs, by lowering blood pressure, can be used to at least prolong life. Seven interesting papers presented at the fourth session dealt with "The Control of Vascular Tone in Hypertension" with special reference by clinicians and physiologists to the many complicating factors involved. Much is yet to be learned concerning the cause of abnormal vascular tone, but attention might seem to be focusing on peripheral vessels themselves rather than to some substance circulating in the blood stream.

This book well deserves a place in all libraries dealing in any way with medical subjects. It is compact, authoritative, and well written. Students of pharmacology and physiology should find it very interesting reading, and clinicians will find much that is new and useful.

Alfred E. Livingston
St. John's University

Progress in Stereochemistry, Volume 2, W. Klyne and P. B. D. de la Mare, Editors. Academic Press Inc., New York, New York, 1958. vii + 323 pp., 44 figs., 46 tbls. $8.80.

Volume 2 of *Progress in Stereochemistry* consists of eight chapters each written by an authority or authorities in the particular field. As might be indicated by the title, this book is not intended as a primer in the field of stereochemistry. Nevertheless, it is written in such a fashion that one need not be an expert to comprehend its content.

Chapter 1, entitled "Crystallography and Stereochemistry," is the physical approach to the conformation of organic structures. The physical methods of determining structure, as well as their limitations, are presented in an understandable manner. This chapter points out that several molecules which are usually considered to be planar are actually distorted due to molecular overcrowding. Even the relatively simple o-dichlorobenzene seems to deviate from the commonly accepted planar structure.

The majority of the chapters should prove to be of interest to the organic chemist. The stereochemical aspects of free radical reactions, displacements at unsaturated centers, and the properties and reactivities of organic molecules due to mesomerism are covered in Chapters 2, 3, and 4. These should be of utmost interest to the synthetic organic chemist. Chapter 5 deals with optically labile compounds, their mutarotations and the effect of environment on these compounds. The stereochemistry of Group V elements is the subject of Chapter 6. Here again the emphasis is on organic molecules containing these elements.

The biochemist and biologist might find the chapter about steric factors in immunochemistry quite helpful. The points in other chapters of the book are well documented by many references, but, by contrast, this chapter is more speculative in nature. This might be well expected because of the nature of the subject. Stereochemistry obviously plays an important role in any concept of antigen and antibody action, and some interesting stereochemical arguments are advanced in this chapter.

The last chapter, "Stereochemistry of Inorganic Molecules and Complex Ions," should be to the liking of the inorganic chemists. This chapter starts with a short discussion of bonding and follows with the stereochemistry of inorganic molecules in terms of the directional character of the orbitals forming the bonds. The chapter goes on to cover the shapes of complex ions.

The concepts of stereochemistry in modern times have helped to explain many of the discrepancies of the old classical organic chemistry. An understanding of stereochemistry is vital to the organic chemist who dares to synthesize, or even understand, the more complex molecules and even some of the more simple ones. The action of drugs, or their lack of action, has been known to depend greatly on their steric properties. Who can avoid mention of stereochemical factors in a discussion of medicinally active steroids or analgesics which are of such great interest today? Thus, it becomes apparent that a good knowledge of this basic subject is necessary to appreciate fully the status of today's chemistry. *Progress in Stereochemistry* could well be recommended as a valuable addition to any chemist's library, but it might well be accompanied by a more elementary text in the field in the case of a neophyte stereochemist.

William J. Rost
The University of Kansas City

The Physical Chemistry of Electrolyte Solutions, Herbert S. Harned and Benton B. Owen. Third Edition. ACS Monograph No. 137. Reinhold Publishing Corporation, New York, New York, 1958. xxxiii + 803 pp., 204 figs., 235 tbles. $20.00.

As the title suggests, this book deals with the physico-chemical properties of solutions of electrolytes. What the title does not indicate is the depth of the presentation; the authors have performed the monumental feat of collecting, correlating, and collating the vast literature in the field.

The book can be divided into two main parts. The first covers the theoretical background for the subsequent material. It presents basic thermodynamic principles and relationships, theories of interionic attraction and ionic atmospheres, the thermodynamics of aqueous solutions, the theory of irreversible processes and includes a chapter on fundamental physical constants and important mathematical functions.

The second part begins with an examination of the experimental methods used in irreversible processes, e.g., conductance and those used in studying thermodynamic properties, e.g., partial molal quantities, colligative properties, EMF measurements. This is followed by a discussion and interpretation of the irreversible processes and thermodynamic properties of solutions of hydrochloric acid, 1-1 electrolytes, polyvalent electrolytes, and mixtures of strong electrolytes, special theories of these solutions, and the ionization of weak electrolytes. The book also contains a sixteen-page glossary of the symbols used in the text and a sixty-eight-page appendix of tables of data.

This is the third edition of this work and is 30 per cent larger than the first (1943) edition. Although the contents of the first edition are presented virtually intact, there have been important additions in the text, and a great deal of recent experimental work has been incorporated. This is attested to by the many references to the literature of 1956 and 1957 even though this edition was published in February, 1958.

The new material presented in the theoretical development includes sections on irreversible thermodynamics, the Mayer cluster theory, the Onsager-Kim treatment of the Wein effect, and the Fuoss-Onsager theory of conductance. The new material in the second part of the book draws heavily on the experimental data recorded since the second (1950) edition.

This is the only reference work that thoroughly covers aqueous solutions of strong and weak electrolytes from the standpoint of their thermodynamic properties, theories, experimental methods, and results. One would wish that the authors had included discussions of the kinetics of ionic reactions, electrode processes, nonaqueous solutions, and spectral studies of electrolytes. Since it is the author's prerogative to define the limits of his presentation, these considerations do not detract from the value of the book. The material that the authors have chosen to treat is well written and covered thoroughly.

This book must be in every pharmacy library for it is a valuable and indispensable reference work for those working or studying in the field of solutions of electrolytes.

Ralph Daniels
University of Illinois

Physical Methods in Physiology, W. T. Catton. Philosophical Library, Inc., New York, New York, 1957. xi + 375 pp., 156 figs., 9 tbls. $10.00.

This book is designed for graduate students in experimental physiology. It is also useful for graduate students who wish to obtain a minor in physiology. Young graduates in physics would find it helpful in orienting themselves in the field of biophysics.

Methods are presented in an abbreviated form, yet the book covers a wide variety of techniques using a physical approach to the problems in physiology. This represents the approach that a physicist would use to attack a given problem of physiological research. As the author indicates, this is not a complete book covering all the approaches to physiology but covers only a limited number of methods that have not been covered in special review articles.

The subject matter is presented as physical methods employed to study the main recognized physiological systems. This includes blood, circulation, respiration, muscle, peripheral nerve, and heat regulation. An additional chapter is included on electronics in physiological research. The digestive system, lymphatic system, and the kidney have not been included in this book. The theory and material are presented in a concise and limited manner. Enough of the theory is given to be clear in exposition but compact enough to be covered in a single volume.

This book should be used as a textbook for graduate students interested in experimental physiology. It should act as a guide to acquaint the student with the various possible approachs to problems in physiology. The two volumes on *Medical Physics* and the three volumes on *Methods in Medical Research,* both published by the Year Book Publishers in Chicago, are better sources of references to the student but are not organized to be used as textbooks in physiological research. The book, *Physical Methods in Physiology,* is ideal for conducting a short graduate course in advanced physiological techniques.

Leslie E. Edwards
Medical College of Virginia

Scientific Russian. A Textbook for Classes and Self Study, James W. Perry. First Edition. Interscience Publishers, Inc., New York, New York, 1950. xxiv + 816 pp. $7.50.

If one out of every ten or, even, out of 100 American scientists were to master the material contained in this substantial volume, our position vis-a-vis Soviet scientists would be greatly strengthened. Language barrier has been used as an excuse to explain our appalling ignorance of the day-to-day progress in science by the Soviet colleagues. Obviously it is a lame excuse because, if the barrier exists, it is all one way and to our disadvantage: the average Russian scientist gets sufficient exposure to English during his school years to read English language publications, at least in his own specialty.

Professor Perry's admirable text attempts and succeeds in making the learning of "Scientific Russian" sufficiently enticing and painless to overcome the usual refractoriness of the average American scientist to a foreign language. With such a learning aid at his disposal the scientist needs only sufficient motivation and some spare time.

The author assumes that the student is completely innocent of any knowledge of Russian and therefore begins at the beginning: the alphabet, transliterations, and then smoothly passes to easy reading exercises based on cognates. This should give the reader a sense of quick accomplishment when he realizes that so much of Russian (particularly of scientific Russian) is really so similar to English, French, and German. Formal grammar is held to a minimum, but, nevertheless, the student gets adequate instruction in the elements of Russian grammar to handle the numerous Russian-to-English reading assignments. In this he is aided by a Russian-English vocabulary appended at the end of the text. Because Russian, like any living language, abounds in idioms, the student is given a helpful forty-page section dealing with this aspect of the language. Considerable attention is devoted to the participles and gerunds which are so important in today's literary and scientific Russian, and yet which so often appear to be, strangely, de-emphasized in the beginning Russian texts available to American students .

No book can please everybody; this book, in the opinion of this reviewer, has its shortcomings, too. One can question, for example, the rationale of giving only the endings, rather than illustrating with a "model" when initiating the student to the declensions of nouns and adjectives. The author perhaps also failed to emphasize adequately the basic functional differences between the English and Russian languages in the use of the verb. This failure can cause some frustration on the part of the student in trying to grasp the elusive notion of imperfective and perfective aspects. Calling the future tense of a perfective aspect verb "perfective future tense" does not help matters. Also a little more consistency in identifying the parts of speech would be a welcome help to the student (example: lesson 3).

But all of these are relatively minor points and do not seriously detract from the basic soundness and usefulness of the book. It is a more ambitious effort than *Scientific Russian Reader* of Professor N. D. Gershevsky, which it preceded by two years. Because both are slanted toward physical sciences, time seems ripe for a scientific Russian reader and text in biological sciences.

I. L. Kosin
State College of Washington

Dangerous Properties of Industrial Materials, N. Irving Sax, Editor. Reinhold Publishing Corp., New York, New York, 1957. v + 1467 pp., 48 figs., 44 tbls. $22.50.

This massive compendium is a vastly expanded version of the editor's earlier work, *Handbook of Dangerous Materials*. Like the latter, it features a "general" section made up of many brief monographs. Each succinctly summarizes certain properties of a commercial chemical—its physical constants, toxic, fire, explosive hazards, etc.

This edition, however, contains close to twice the number of entries previously listed. Nearly 9000 chemicals are covered in over 1000 pages of such data.

Nine new sections have been added as background to enhance the significance of the data for those with little training. Thus, experts in toxicology, air pollution, radiation hazards, and other areas of industrial hygiene have contributed reviews of the basic principles of their fields.

Unfortunately, the result falls short of the promise of the above description. For pharmacy-oriented readers, at least, the book fails to furnish much truly useful information. Nor are the contents put into readable and cogent language.

The work seems to have been designed primarily for plant foremen, warehousemen, and traffic managers. Perhaps these readers may be able to solve on-the-job problems with this book. They may even mine some nuggets they need out of the 200 fine-print pages that set forth the Interstate Commerce Commission shipping regulations for explosives and combustibles.

But for pharmacy faculty and students, other books dealing with dangerous properties of various chemicals are more instructive and useful. These others may not try to cover quite as much ground, but what they do offer is more meaningful and is better expressed.

Two such books are Fairhall's *Industrial Toxicology* and Patty's *Industrial Hygiene and Toxicology*. Both are now available in very recent revisions. Neither makes any claim to the comprehensiveness sought in this volume. But their contents are more than adequate for most purposes.

Both of these also furnish excellent bibliographical references for each compound discussed, in contrast with this handbook. While it does contain lists of references after some of the sections, these, with one exception, are not keyed to the text. The effect is like that of the book by the English eccentric who put all the punctuation marks in an appendix at the end with the suggestion that the reader garnish the text with them as he pleased.

It may be too much to expect a manual to be scholarly and well written. But, even taken on its own terms, this book doesn't do what it sets out to do. The preface, for example, proclaims: "For the industrial physician we include a section on industrial toxicology and one on allergic disease." Yet, in their opening paragraphs, the writers of these sections say, explicitly, that they have written for readers with little or no training in toxicology or medicine.

Similarly, the preface boasts of "discussing in detail" the toxicology of most materials. But the entry most common to these monographs is simply, "Toxicity: Details Unknown." And such statements as are made are often superficial, meaningless, or misleading.

It may seem indecent to criticize a handbook compiler for not being a prose stylist. Still, someone ought to warn the unwary reader that the writing in the reviews—notably those prepared by the editor himself—is often extremely turgid and dull. The high concentration of barbarisms could be as hazardous to some sensitive readers as the noxious fumes the book deals with.

This work may be a "must" for industrial safety engineers, certain special units of big city fire departments, civil defense officials, and some other specialists. Colleges of pharmacy that serve as poison centers may want to add this book to their shelves, if their funds are unlimited and they feel they must maintain a complete reference file.

But this reviewer, after weighing the limited potential usefulness of this bulky book against its expense, has refused to recommend its purchase for his own college of pharmacy library.

Morton J. Rodman
Rutgers University

Pharmaceutical Laboratory Manual, Gail A. Wiese. Second Edtion. Wm. C. Brown, Company, Dubuque, Iowa, 1957. 296 pp. $4.00 (paper).

The first edition of this manual was written by Dean R. A. Kuever, in 1947. This, the second edition, has been revised to conform to the later issues of the *U.S. Pharmacopeia* and *National Formulary*. There are 142 experiments, each of which represents one preparation except in the last thirteen experiments, which represent toilet and cosmetic items. These, with few exceptions, are represented by more than one formula.

Each experiment covers two pages. The left-hand page offers the titles, synonyms, modified official formulas, and directions for preparing the products. Information is given about *storage, uses and modes of application, alcohol content, constituents, chemistry*, and the *usual dose* in addition to much that is special. For example, under Aspirin Capsules, empty hard and soft gelatin capsules are briefly discussed.

This leads the reviewer to express the feeling that this manual represents a combination of the information to be found in good textbooks of pharmacy and the *U.S. Pharmacopeia* and the *National Formulary*. Instead of giving the students the information in an abbreviated form in the manual, why not permit them to glean it from the original sources? This plan would, of course, require

work, but it is a way of teaching students to read and abstract the information to be found in books.

The preface to the second edition states that the manual should serve to teach techniques, processes, and principles with demonstrations. Demonstrations and explanations are good but are not enough. An endless amount of elbow-to-elbow work with the students is required to indoctrinate them with the value of good techniques in pharmacy, and this approach is not stressed.

Experiments 17 to 129 represent pharmacy sandwiched in between experiments 1 to 16 and 130 to 142. For this reason the arrangement of the 1947 manual is preferable. The making of the inorganic pharmaceuticals, represented by experiments 1-16, involves rather complicated techniques and should follow the course in pharmaceutical preparations. The manufacture of cosmetics involves the techniques of pharmacy and should, for that reason, be offered in the curriculum after the beginning pharmacy courses.

About 79 per cent of the experiments of the *Manual* have to do with pharmaceutical preparations and deserve to appear first in the book with an appropriate subtitle. Inorganic pharmaceuticals and cosmetic preparations should likewise be indicated with appropriate subtitles and numbered as separate groups.

This manual has much to recommend it. It is in a convenient spiral binder, the choice of preparations is good, and the subject matter well presented. The questions are well chosen, but it would seem that the chemical equations should be left for the students to complete and balance. Since so much textbook information is given under the experiments, the official titles should be designated either USP or NF.

C. O. Lee
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Organic Colloids, Bruno Jirgensons. Elsevier Publishing Company, New York, New York, 1958. xiv + 625 pp., 160 figs., 95 tbls. $16.25.

This book is divided into two parts. The sixteen chapters of Part I present a general review of the methods of preparation and study of organic colloids. The eighteen chapters of Part II give a condensed discussion of the most important classes of molecular and micellar colloids.

Definitions of terms used in this field are given and should be very beneficial, especially to those who are not specialists in the area of colloids.

Problems presented by the author in the realm of organic colloid chemistry should stimulate research. He relates that purely chemical views and data have been quite important regarding simple organic compounds, but these combined with physiochemical tools should unravel many of the mysteries regarding synthetic polymers, the reduplication of proteins, viruses, nucleoproteins, and enzymes. The mechanism of enzyme action, the configuration in the specificity of enzymes, characterization of blood proteins in diseases, the mechanism of blood clotting, permeability of cell membranes, and antibody formation from the globulins of blood challenge the combined research efforts of the organic, colloid, and biochemists.

Methods for the preparation and physical measurements of colloids are described in a clear, concise manner. Illustrations of equipment and instruments add to the clarity of the presentation. Chemical and mathematical equations are used to advantage.

Practical and theoretical discussions of synthetic and natural-occurring colloids are presented in a very interesting manner. Details concerning many commercial products are given.

The importance of colloids in normal and abnormal tissues is vividly emphasized. Nucleic acids, nucleoproteins, viruses, bacteriophages, cells, connective tissue, fats, phospholipids, aspects of muscular contraction, nerve tissue, blood, blood groups, agglutination, immunochemical reactions, phagocytosis, fibrinogen, and Bence-Jones proteins are discussed in such a manner that the reader is convinced that he is dependent upon colloids for good health. Dr. Jirgensons' enthusiastic treatment of this phase of colloid chemistry will undoubtedly inspire additional research which will improve diagnostic methods.

This book will afford interesting and informative reading for all chemists and clinicians. With the use of the extensive bibliography, one may explore the field of organic colloids with relative ease.

C. B. Pollard
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. . . each professional group struggles with its own educational problems assuming them to be so nearly unique as to have little in common with those of other professional groups.

James E. Cutler, Am. J. Pharm. Ed., 2, 324 (1938)

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Research, vision, wisdom, and cooperative effort are required to find the best possible solution for the common problems that are inherent in the advancement of professional education.

James E. Cutler, Am. J. Pharm. Ed., 2, 330 (1938)

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